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The Experience of Absorption: Comparison of the Mental Processes of Meditation between Emic Yogic and Etic Neuroscientific Perspectives on *Ishvara Pranidhana* Meditation

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by

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The Experience of Absorption: A Comparison of the Mental Processes of Meditation between Emic Yogic and Etic Neuroscientific Perspectives on *Ishvara Pranidhana* Meditation

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Modernity has seen the exchange of ideas about cognition between western science and eastern meditation traditions. In particular, western ways of thinking about the natural world have infiltrated Indian theories of yoga. This intersection of ideas in the twentieth-century has resulted in a problematic trend to theorize yogic phenomena, including meditation, in scientific terms. These translations converge on explicating yogic processes within a context of advancing knowledge about the brain. This translational approach to bringing etic and emic perspectives together in the same framework results in interpretations of meditation that succumb to problems cognitive science faces at a broader level in theorizing cognition and mind-body interrelations. In this study, I take a different approach to bringing emic and etic perspectives together by placing a phenomenologically interpreted emic account of absorption (the meditative shift in consciousness) into dialogue with current scientific understandings of three central mental processes of meditation. Specifically, I analyze ways of conceptualizing

attention, memory, and emotion, and their underlying mechanisms as posited in yoga and science, focusing on the problem of how each system interprets the reality of absorption. This comparison suggests a basic similarity between the two systems: theorizing cognition and meditative absorption in terms of embodiment. This finding emphasizes the dual nature of embodiment as both experiential and physical. Finally, I consider this dialogue from an embodied mind perspective, an emerging way of thinking about and theorizing the mind-body in cognitive science, because this perspective challenges longstanding theoretical problems in western understandings of how the mind works. This analysis suggests that theorizing meditation in these dual terms of embodiment potentially solves the reductive challenges of dualistic and materialist philosophy that have plagued both religious and naturalistic attempts to explain absorption. This interdisciplinary dialogue provides a framework with which to think more critically about translational and cross-disciplinary efforts that have previously confused the goals of yoga and science and their respective foci on practice and mechanisms. I conclude that bridging ideas in this dialogical way reveals a complementary perspective between phenomenological and biological ways of understanding the mind that both hinge on embodied cognition.

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PART 1

Chapter One

Experience and Physicality: Dual Realities of Meditative Absorption

In recent decades, the Western world has seen meditation grow in popularity among people interested in relieving personal suffering and attaining psychological well being or spiritual growth (e.g., Barnes, Powell-Griner, McFann, and Nahin, 2002; Barnes, Bloom, and Nahin, 2008). For example, a 2007 US government survey that sampled over 23,000 adults found that nearly 9½ % of the population had used some form of meditation in the previous year, up from 7.6% in a similar survey conducted in 2002 (Barnes, Bloom, and Nahin, 2008). Meditation is also one of the most widespread and researched of all psychotherapeutic methods (Walsh and Shapiro, 2006). However, despite all of this research there is still no widespread consensus and acceptance of the potential healing power of meditative practice, especially within healthcare communities, in part because there are widely different views and theoretical perspectives on meditation. For example, meditation has been defined both in terms of relaxation and intense concentration (Jaseja, 2008). This breadth of meditative discipline complicates the systematic scientific study and evaluation of specific practices from the scientific perspective (Lutz Dunne, and Davidson, 2007).

A main reason for the popularity of meditative practices among practitioners, clinical professionals, educators, and researchers is the belief that meditation effects a profound and enduring psychological transformation within the mind of the practitioner (Rama, Ballentine, and Ajaya, 1976; Shaperio and Giber, 1978; Murphy and Donovan, 1997; Whicher, 1997; Anantharaman, 2007). Most meditation traditions would agree that

meditation entails a shift from an ordinary state of consciousness into another state, one that meditation traditions define in terms of absorption (*samadhi*) (Feuerstein, 1979; Bastow, 1980; Chapple, 1982; Whicher, 1997). Both philosophical and phenomenological descriptions of this state abound (Lutz, Dunne, and Davidson, 2007), as well as trait-like descriptions of characteristic qualities of meditative consciousness (Cahn and Polich, 2006). The unusual combination of a calm and peaceful yet alert mind, along with joyful and blissful feelings, is believed to characterize this state, and in some meditation methods, practitioners claim to feel close with or one with god when in this state (Aurobindo, 1976; Goleman, and Schwartz, 1976; Delmonte, 1985; Murphy, and Donovan, 1997; Levine, 2000). Such meditative consciousness has been described as "mystical" in both Western and Eastern literature (James, 1902; Eliade, 1958; Feuerstein, 1979), particularly by theistic traditions that involve contemplation of ultimate reality in terms of god (James, 1902; Proudfoot, 1985).

However, because of labels such as "mystical" and "transcendent," meditative states, especially those induced through mantra (a sound or collection of sounds, a syllable, or a word, often with a specific meaning, believed to be capable of creating transformation), are also viewed with skepticism by people who take for granted the Enlightenment consensus against belief in "magic" (Alper, 1989). As a result, alternative explanations are sought. Two likely reasons for this disinclination to embrace meditative practice are: (1) the philosophical or religious belief systems surrounding Eastern meditative traditions outwardly clash with dominant Western ideology and, more specifically, (2) the limited scientific understanding about phenomena related to meditation. In their own ways, both of these factors influence intellectual perspectives

and research on meditation, especially when they depend on theories about how the mind and body interrelate. Religious, philosophical, historical, and scientific perspectives, to name a few, have all participated in and influenced the millennia-long dialogue on a psychological understanding of meditation. This project focuses at this nexus, where these multiple perspectives converge in both emic and etic ways of understanding the mind's transformation during meditation, in an attempt to penetrate the mystical shrouds surrounding states of meditative absorption.

Theorizing Meditation

At least three central problems presently confound a psychological examination of meditation. The first concerns the theoretical problem of characterizing the state of meditation because meditation processes are conceived of in both physical and psychological terms, even though these terms of interrelation are not always clear. This problem is especially evident in the common view of meditation as tool for coping with mental and emotional states implicated in suffering, because coping processes are also conceptualized in both physical and psychological terms (Folkman and Lazarus, 1988; Sapolsky, 1994). Thus, meditation is often referred to in popular culture as a "mind-body" practice or – as is growing in popularity – therapy (Harrington, 2008). For example, one sphere in which meditation has gained some degree of acceptance is within clinical practice as a strategy for helping people cope with both psychological and physical problems (Barnes, Powell-Griner, McFann, Nahin, 2002), and stress-related problems such as anxiety, pain (e.g., Kabat-Zinn, et al., 1995; Kabat-Zinn, et al., 1985), and depression (Teasdale et al., 2000), all of which have both physical and psychological

dimensions. Clinical and research interest in the potential usefulness of meditation as a treatment protocol has become so great that the National Institutes of Health (NIH) National Center for Complementary and Alternative Medicine (NCCAM) adopted meditation and yoga within their definition of mind-body medicine (Harrington, 2008).

This issue of the dual psychological and physical nature of meditation takes on special significance in light of recent trends to view both stress and coping in relation to emotion (Folkman and Lazarus, 1988; Tugade and Fredrickson, 2004), emotion regulation (Gross, 1998; Davidson, Jackson, and Kalin, 2000), cognitive, appraisal, and relational processes (Folkman and Lazarus, 1988; Frijda, Kuipers, and Ter Schure, 1989; Lazarus, 1993; Ashby, Turken, and Isen, 1999), and self-regulation (Posner and Rothbart, 2000; Beauregard, Levesque, and Bourgouin, 2001; Watt, 2004; Posner, Rothbart, and Sheese, 2007). This is because meditation has been shown to affect all of these processes. For example, more than a means to induce relaxation (Benson, Beary, and Carol, 1974), meditation has been shown to improve negative emotion states such as anxiety and depression (Delmonte, 1985; Miller, Fletcher, and Kabat-Zinn, 1995), and has thus been seen in terms of emotion regulation (Fredrickson, Coffey, Pek, Cohn, and Finkel, 2008). Meditation has also been shown to affect cognitive processes implicated in stress and coping responses, such as attention (Tang et al., 2007) and memory (Sreenivasan and Jha, 2007). Meditation is currently used as a tool to help with cognitive appraisal (e.g., Teasdale, Segal, Williams, Ridgeway, Soulsby, and Lau, 2000), and is now seen as a means of improving conscious self-regulation (Tang, et al. 2007).

The central problem with theorizing meditation is that emic and etic theories of mind and body differ in important ways. Science focuses on the mechanical processes of

the body, and especially in the past two decades on the brain, while religion emphasizes the person's experienced relationship with the cosmos. These are very different levels of analysis, yet both perspectives attempt to understand human nature and meditation. This problem is further complicated by competing theories within each system. These differences all contribute to different understandings and potential misunderstandings about absorption.

These different levels of analysis reveal two further problems in understanding meditative absorption. A second problem in advancing psychological understandings of meditation relates to the nature of scientific research as developed in the West. Turning to objective scientific measures of absorption during meditation, such as neurophysiological data from the brain and body, can help make sense of meditative experience because of the universal nature of the discourse that scientific language offers. But there are limits to this way of knowing. On one level, while modern Western science has been gathering objective data about various meditation techniques and traditions for at least the last 60 years, major gaps exist in our scientific knowledge about meditation (Cahn and Polich, 2006). These gaps are related to limitations in research methodology, design, and theories, which limit the potential for obtaining replicable data and meaningful inferences.

On another and broader level, however, although scientific research into meditative phenomena offers mechanical understandings about the workings of the brain and body during and resulting from meditative practice. This standard scientific way of knowing does not address meanings and purposes (Taylor, 1985). By definition a scientific problem assumes that a phenomenon is observable and measurable, and that

collected data pertaining to the phenomenon will either support or refute the theorized hypothesis (or possibly be inconclusive). Yet meditative states have everything to do with meaning and purpose (Alter, 2004). Thus, perhaps at least some aspects of understanding meditation may not be solved through this method. From this perspective, the process of gathering and analyzing data about observable phenomenon is limited in its ability to account for the meditator's subjective or interpreted experience that emerges out of values, meanings, purposes, and goals. This limitation occurs because the language of neuroscience is, by definition, restricted to the structures and mechanisms so far discovered by science (Cook, 2002). Moreover, the scientific paradigm by definition omits considerations of final causes from its explanans (Olsen, 2004), while causality seems to be at the heart of meditation in important ways that cannot be overlooked when constructing theories about meditative phenomenon. As Slife and Williams (1995) and others have pointed out, not only physical science but social science, as well, suffers from problems of abstraction: the scientific method abstracts away meanings, values, and subjective experience.

Thus, the barrier of scientific research in fully explicating meditation is that science cannot evaluate (perhaps yet) central aspects of meditative phenomena. How can we understand the psychological processes of personal interpretation or appraisal and meaning at work that underpin meditative phenomena, especially given the known biological constraints assumed by the body? This problem is largely theoretical, entailing numerous philosophical issues that all turn on how one interprets the realities of the body and mind. Keys to solving this problem might entail looking to emic perspectives of meditation with their inherent philosophical and meaning systems; however, not

everyone agrees with this approach. For example, when it comes to the particular state of consciousness implicated in yogic meditation, Alter (2004) argues that while science certainly cannot, neither can philosophy ever explain subjective experience. Alter argues instead that this dimension of human life can be known only to the subject. Others have turned to phenomenology as a way of linking scientific understandings of cognitive phenomena such as meditation with meaningful interpretations (Pekala, Wenger, Levine, 1985; Pekala, 1987; Varela, Thompson, and Rosch, 1991; Venkatesh, Raju, Shivani, Tompkins, and Meti, 1997). The controversies about theories of cognition directly influence contemporary psychological understandings of meditation because these center on qualities present during an absorptive state, and especially if and how such qualities become embodied. These issues are at the center of my efforts here to examine meditation.

Related to problems of meaning, a third problem involves the "truthfulness" of any given account of meditation (Alter, 2004). Emic accounts of "mystical" experience attempt to describe the moment of the person's contact with, knowledge, or perception of ultimate reality (James, 1902; Proudfoot, 1985). Different emic systems differently characterize this reality, with some systems framing ultimate reality in terms of god-talk (De Michelis, 2004). Because of an assumption of continuity of consciousness beyond normal boundaries of self (Larson, 1969), emic or religious explanations of mystical experience tend to treat the body as one part of a person's reality, but not the whole. Within the physical structure of the body exists subtle dimensions of mind and consciousness, with conscious awareness tied to the ultimate nature of self and the world that are ultimately the same (Feuerstein, 1998).To express embodiment on this "cosmic"

level, emic systems often use myth and metaphor to extrapolate descriptions of bodily structures and processes that operate during mystical phenomena so as to convey meaning (Muller-Ortega, 1992; Campbell, 2001). Such accounts of mystical phenomenon draw from traditional religious studies perspectives that are embedded in social and historical contexts, which may or may not be fully relevant today (De Michelis, 2004). Therefore, to the extent that emic accounts are taken literally rather than symbolically, they acquire a limitation, or perhaps a great challenge, in their ability to speak to a modern "truth" or evolving scientific understanding of the body and its physiological processes.

Central Problem of Explaining Absorption

In these chapters, I examine these three interrelated problems that all influence attempts to explain the phenomenon of meditative absorption. Focusing on a psychological question, one might ask whether an emic meditation account of absorption, with its unscientifically developed (in the sense of being empirically tested and verified) ideas about changes in bodily processes, actually explains the meditator's personal or believed "truth" of meditative consciousness. In his identification of the marks of mystical experience, James (1902) names ineffability as a primary quality that marks a mystical state, along with a noetic quality of implicit knowing. James explains that mystics claim that the experience "defies expression" – they cannot adequately report the contents of the experience. Thus the experience is ineffable. In this sense, "mystical states are more like states of feeling than states of intellect" (James, p. 371). If ineffability is truly characteristic of mystical phenomenon, then one who has never personally

experienced the state cannot interpret it. This personal authority essential to meditative experience leads Alter (2004) to doubt the validity of scientific attempts to explain the "truth" of yogic experience, which often comes from meditation, since ultimately, he thinks, science can neither validate nor deny meditators' claims about personal experience. In this sense, one might wonder if the emic account, whether a practitioner's personal account or an account gathered from the emic texts, is the only perspective to draw from to gain access and insight into the experience.

However, Proudfoot (1985) criticizes ineffability as a "mark" or criterion of mystical phenomena. Illustrating a basic tension between emic and etic accounts of meditative absorption, Proudfoot calls the claim of ineffability a protective strategy because by identifying ineffability as a qualifying criterion of emotional states such as absorption, emic perspectives "preclude the possibility of a naturalistic description." For Proudfoot (and modernity since it focuses on natural phenomena), this is a problem. Instead of focusing on the emotional aspect of mystical phenomenon, Proudfoot draws attention to the noetic or cognitive component, which, he insists, cannot be ignored in any evaluation of the experience. He argues that, while we often have tacit criteria for judging the appropriateness of emotional experiences in different contexts, philosophical and psychological analysis can draw out the criteria of the noetic quality.

Proudfoot (1985) also criticizes the criterion of ineffability on the grounds that experience is or can be ambiguous, and that we interpret such experiences in light of our beliefs. In fact, he claims, background knowledge and assumptions or concepts and beliefs are "constitutive" of experience. In particular, the tacit belief about the cause of a perception is integral to one's experience. Proudfoot (1985, p. 192) explains, "A

perceptual act can only be described by reference to its object, [and] a religious experience must be identified under a certain description, and that description must include a reference to the object of the experience." He goes on to specify that the cues we use to interpret our experience are normally unproblematic, except in the case of religious experience when an external observer might be a better judge of the cause of one's experience because such an observer might have access to more information from their perspective. Such external or objective observation leads one to arrive at a naturalistic explanation. However, in contrast to this observer account, Alter (2004) believes that a subjective account is the only valid account of a meditator's own personal truth of meditative consciousness, and that science cannot and, in fact, should not attempt to explain such a truth. Objective observation cannot access the very aspects of subjective experience that constitute personal truth. Others have alternatively either agreed with James's claim of ineffability but sought to examine the psychological processes that may contribute to the ineffability of mystical experience (Braud, 2002), or urged us to recognize that there are neural substrates of the conscious processes that are perceived as ineffable qualitative experiences (Musacchio, 2005).

This tension between religious and scientific perspectives regarding the effability of meditation has led me to consider the merits and shortcomings of each position, which positions are more advantageous towards understanding absorption, and which seem to confuse our understanding of meditative phenomena. Is "ineffability" actually a protective strategy? Can naturalistic approaches genuinely offer better explanations of mystical meditative phenomena? Or is it instead the case, as I argue in this dissertation, that both emic and etic accounts contribute significantly to an understanding of the

phenomena? Here I argue that, while science examines physiological processes to describe what happens in the body during meditative phenomena, and emic perspectives uncover the meaning of mystical phenomena by using myth and metaphor to describe the world phenomenologically, a perspective that takes into account both of these views would offer the most complete explanation of states of meditative absorption. This complementary approach views experience and physicality as two sides of the same coin: embodied cognition.

However, I have not come across such a dual perspective of meditation and believe that one does not yet exist. Moreover, articulating such a perspective would prove to be extremely difficult because of the numerous challenging philosophical and empirical questions that would need to be answered to make such a perspective coherent. This grand undertaking is not my immediate goal here.

Purpose of the Study

Instead, in an effort to build some bridges between an emic meditation tradition's and the etic scientific tradition's understanding of meditation, this dissertation examines similarities and differences between the two systems' perspectives with the goal of identifying conceptual areas of overlap and incongruence. I focus on comparing the mental processes of the same meditation method through the lens of each system, with a special focus on the body (and, by extension, the brain). This includes an examination of the boundaries between disciplines and the language problems that arise when engaging the discourses of multiple disciplines.

I undertake here the theoretical task of conceptually analyzing similarities and differences between explanations of meditation that draw from two ways of knowing. I attempt to determine to what extent the language of each system characterizes similar and different aspects of absorption as a meditative phenomenon. Identifying areas of overlap might advance our understanding of meditation, and, in turn, generate new avenues for research. Neuroscience might benefit from examining primary emic explanations to see if there are some aspects of meditation addressed in the emic explanation that can be better understood by neuroscience and also considering seriously the methodology of meditation (Varela, Thompson, and Rosch, 1991). For example, an emic system could provide direction for both neuroscience programs of research on consciousness and the growing body of research literature showing support for meditation as an evidence-based intervention. In addition, emic perspectives might benefit from other terminologies to help explain subtle experiences. Therefore, my goal is to clarify interrelationships between some of the various conceptual ideas, models, theories, and perspectives that currently bear on the problem of explaining absorption during meditation, focusing in particular on the mental processes of meditation. By examining these theories and evidence of meditation, I hope to contribute to a better theory of mind-body interrelation that can address the multiple dimensions of human nature.

Analytic Method: Explicating and Comparing Emic and Etic Interpretations of Absorptive Meditation

In common terms, meditative absorption can be thought of as a concentrated state in which one focuses on a single thought or task, and other thoughts seldom arise. The

word “concentrated” here could potentially create some confusion with certain kinds of open awareness meditation. I refer interested readers to a review article by Lutz, Slagter, Dunne, and Davidson (2008) who address this issue of concentration by clarifying that open awareness styles of meditation initially use concentration (what Lutz et al. call focused attention) “to calm the mind and reduce distractions” (p. 164). Then, according to Lutz, as open awareness meditation progresses, the practitioner gradually reduces attentional focus on an explicit object while switching over to emphasizing the monitoring faculty necessary for open awareness. From this description, we can see that concentration is a necessary skill in most if not all forms of meditation.

In a seminal psychological study of absorption, Tellegen and Atkinson (1974) define absorption in terms of an openness to absorbing and self-altering experiences as follows:

> [absorption is] a disposition [trait] for having episodes of “total” attention that fully engage one’s representational (i.e., perceptual, enactive, imaginative, and ideational) resources. This kind of attentional functioning is believed to result in a heightened sense of the reality of the attentional object, imperviousness to distracting events, and an altered sense of reality in general, including empathically altered sense of self (p. 268).

According to this definition, the mental process of attention is centrally involved in states of absorption. Therefore the analytical task of this dissertation is to explore how attention operates in states of absorption that are induced through one meditation method. It could be possible that this analysis will have implications for other meditation methods. Attention is intricately interrelated with other major psychological processs, such as emotion and memory. For example, attention is modulated by both emotionally valenced stimuli and memories (Lang, Bradley, and Cuthbert, 1997; Vuilleumier, 2005; Mikels,

Reuter-Lorenz, Beyer, and Frederickson, 2008) and attention is shaped and directed by memory stores (Sara, 2000; Nader, 2003). Thus a focal point of this study will be to examine how each of these three processes – attention, memory, and emotion - bear on the absorption phenomenon during meditation.

Most if not all religious traditions have some version of religious practice that leads to absorption (Feuerstein, 1998; Campbell, 2001) and absorption can even be a non-meditation state. For example, the Buddhist meditative tradition identifies eight states of absorption (Feuerstein, 1979, 1998). Christian prayer is thought to lead to absorption into God. The whirling dervish dance of the mystical path of Muslim Sufis is thought to lead to absorption in trance states. Even drumming is thought to lead to some sort of spiritual experience in some traditions such as Russian shamanism (Campbell, 2001; Lutz, Dunne, and Davidson, 2007). Even some non-meditative secular activities such as reading and playing music may lead to absorption or what Csikszentmihalyi (2000, 2002, 2009) calls "flow," a state similar to absorption in which an individual gains intrinsic rather than extrinsic reward from intensive engagement with activities that lead to absorption. Meditative absorption is, then, a particular instance of the more general type of absorption defined by Tellegen and Atkinson (1974).

The central focus here is to understand the psychological processes of a particular form of absorption: the religious, spiritual, or mystical form of absorption that is purposefully cultivated in meditation. Because of the vast number of meditation practices and traditions that are believed to lead to absorption and mystical experience (Feuerstein, 1998), and in the interest of space, I have limited my focus to one particular tradition and one practice within that tradition to enable some degree of depth in my comparison of an

emic tradition with a scientific perspective. Narrowing the scope of this study to one particular contemporary meditation practice leading to the experience of absorption and its emic perspectives will make pursuing this research on meditation more tractable. I compare this emic perspective with a scientific account of the same meditation method. I chose one contemporary tantric yoga meditation practice called *ishvara pranidhana* for a number of reasons.

Why Focus on the Tantric Yoga Practice of *Ishvara Pranidhana*?

Many people may think of yoga as practicing physical postures (De Michelis, 2004); however, yoga has a long meditation tradition (Feuerstein, 1979; Pfleuger, 2005; Connolly, 2007). Eliade (1958, p. 4) explains that the term "yoga" itself indicates meditation, but can refer to meditation practices from the many various "Indian philosophical currents and mystical movements." The yogic path of meditation is to turn one's attention from the normal happenings in the world towards an ultimate reality. This meditative state leads to "absorption" (or *samadhi*), a state in which the mind is fully occupied with the meditative task (Chapple, 1982; Whicher, 1997). In yoga terms, this process is often described as a "withdrawal" (*pratyahara*) of oneself from the sensory world or occupation with worldly concerns during ordinary states of conscious awareness. Yogic traditions have not only rich and deep philosophical systems, but also a number of multi-layered psychological models that explain the mind's operations during shifts from normal to absorptive or meditative states of consciousness. Feuerstein (1979) and others (e.g., Pensa, 1969; Oberhammer, 1989; Whicher, 2005) explain that there are two potential goals or outcomes to such practice: (1) to quiet mental functioning

(*nirodha*) or (2) to acquire some sort of existential insight into one's own nature (*samadhi*). *Ishvara pranidhana* is a specific practice named in the Classical Yoga tradition that has both of these goals (Eliade, 1958; Oberhammer, 1989; Miller, 1995; Pfleuger, 2005; Connolly, 2007).

Because there are many ways to practice *ishvara pranidhana*, I chose just one: Shrii Shrii Anandamurti's method of *ishvara pranidhana*. Anandamurti's method of *ishvara pranidhana* meditation presents an interesting focus for several reasons. First, this is a contemporary meditation method with perhaps over a million practitioners around the world (Crovetto, 2008). That this is a living daily practice is important in terms of analyzing contemporary understandings about meditation from both perspectives - the emic perspective as well as scientific or etic understandings. Also, there is some brain and physiological data published in peer-reviewed scientific journals regarding this exact meditation method (e.g., Elson, Hauri, and Cunis, 1977; Corby, Roth, Zarcone, and Kopell, 1978). By examining these studies, it was possible to consider at least some empirical data related to *ishvara pranidhana* meditation. This was especially helpful because it is not clear to what extent different types of meditation affect the brain and physiological processes.

Second, though the focus is on *ishvara pranidhana*, I have found it possible to access a broader field of scientific literature by considering meditation methods whose effects on the brain and body are likely to be similar to *ishvara pranidhana.* However, I needed a way of distinguishing between techniques and practices that were sufficiently similar to and different from Anandamurti's method of *ishvara pranidhana*, so as to better specify the particular meditative mental task and tap into neuroimaging studies of

similar methods of absorptive meditation. The key distinguishing criterion I used to decide which meditation would be considered as similar to *ishvara pranidhana* was whether the method uses mantra and visualization. These are two distinguishing techniques of *ishvara pranidhana*, which combines the use of mantra and visualization in order to focus attention and encourage spiritual introspection, resulting in absorbed states of consciousness.

Third, I chose to focus on *ishvara pranidhana* because I have the most experience with this method of yoga in terms of personal practice, academic studies, and access to the community of meditators who practice this method, and therefore have greater knowledge about this technique and emic perspective than any other meditation practice. I have spent 13 years (since spring 1997) listening to lectures, interviewing teachers and practitioners, and reading literature on this particular meditation method, including attending a number of retreats (varying from a weekend to six weeks long in length), workshops and classes, weekly meditation sessions, and an extended six-month stay at yoga retreat center where this is the meditation practice.

Another reason for examining this method of meditation relates to the fact that, Anandamurti has identified *ishvara pranidhana* as a particular kind of yoga practice, namely tantric yoga. White (2003) explains that tantra is a predominant religious paradigm through which to interpret the history of Indian culture and religious developments. Yogic theories about absorptive meditation from the tantric tradition might offer keys to advancing a dialogue that compares scientific and emic yoga perspectives because tantric concepts link the mind with the body in more concrete ways than the philosophical and psychological concepts and theories widely understood in pre-

and Classical Yoga. For example, unlike some other schools of yogic thought, tantric yoga embraces the body rather than the mind alone as a vehicle by which a person can go beyond ordinary experience of the world and perceive the unchanging aspect of reality (Feuerstein, 1998). From the tantric perspective, this embodied experience represents attainment of spiritual knowledge (Alper, 1989; Muller-Ortega, 1992).

Science, Tantra, The Body, and The Mind.

Over the past three decades, there has been a trend in psychology and neuroscience, and cognitive science more widely, towards a biological perspective on the mind and psychological processes (Varela, Thompson, and Rosch, 1991). This perspective focuses on the body's and, especially, the brain's role in mental functioning. Theories of an embodied mind seem to be gaining repute within neuroscience (e.g., Valera, Thompson, and Rosch, 1991; Lakoff and Johnson, 1999; Osbeck, 2009), though what mind means and exactly how it is embodied in the brain and body does not seem to be fully conceptualized (Roskies, 1999). Because tantric yoga theories of the mind also emphasize the body, this commonality provides a focal point for meaningful comparisons of theories of body and mind that bear on meditation processes.

Tantric yoga texts also advance detailed elaborations and theories of mantra (that were developed in earlier historical texts of yoga) that relate the mental processes of meditation to the yogic body and its "physiological systems" (Flood, 2006). For example, yogic texts conveying information about the field of yogic physiology describe subtle dimensions of energy systems within the human organism (Eliade, 1958; Avalon, 1919/1974; White, 1996). These subtle dimensions are known in yoga as the "subtle body." The "biopsychological" centers (*chakra*s) (Sarkar, 1991) of this subtle body serve

as bridges conducting the flow of energy between the body and mind that are believed to transform during mantra recitation (Alper 1989; Muller-Ortega, 1992).

Furthermore, emic yoga texts posit that there are sheaths or layers of mind within this subtle yogic body that indicate levels of consciousness (kosa theory), and, in many of the classical Indian texts that deal with yoga, the mind is conceptualized in terms of its *degrees* of material substance (Samkhya theory) (Eliade, 1958; Larson, 1969; Jacobsen, 2005; Connolly, 2007). Finally, in tantric yoga, consciousness is assumed to be the essence of all matter (Muller-Ortega, 1988) - both biological and inert – and the psychological implications of this assumption, notwithstanding metaphysical implications, are significant. Because tantric yoga meditations, whose primary methods are mantra and visualization, grew out of this tantric knowledge of the body, they serve as an ideal model for comparison with scientific theories. This comparison pursues answers to the question of whether and how views from the emic perspectives on meditation are similar to and different from etic neuroscientific accounts.

Non-tantric Methods of Meditation.

As mentioned above, "yogic" meditation covers a vast field of practice in terms of techniques and meanings (Feuerstein, 1998). Although meditation techniques of mantra and visualization are central to tantric yoga practice, and central to *ishvara pranidhana*, absorptive meditation does not necessitate the use of tantric methods of mantra and or visualization. Understanding some basic differences between tantric and non-tantric meditation can help clarify methods of absorptive meditation. For example, other non-tantric object-oriented absorptive meditation methods such as Buddhist *samatha* meditation employ natural objects such as the breath or sensations in the body as a means

of concentrating and quieting the mind (Lutz, Dunne, and Davidson, 2007), while objectless meditation methods such as Zen meditation simply rely on awareness to attain meditative states (Austin, 1998). Further still, some non-tantric absorptive meditation methods, such as mindfulness meditation as popularized by Jon Kabat-Zinn (1982; 1985; 1992) combine an object and objectless method, and draw from Buddhist teachings. Absorptive meditation practices that emphasize these non-tantric processes are also widely popular in the general population and the subject of current scientific research (e.g., Kabat-Zinn and colleagues 1982, 1985, 1992; Davidson and colleagues, 2003, 2004, 2007; Fredrickson, Coffey, Pek, Cohn, and Finkle, 2008; Tang et al., 2007).

I believe that using the method of this dissertation to analyze any of these meditation methods to draw out the noetic quality - that is, conducting a comparative psychological and theoretical analysis of mental processes of meditation between any emic and etic perspective - would be equally valuable and beneficial to undertake, but space and scope limits this particular study to just one meditation technique. I have chosen tantric yoga not because I feel that Buddhist meditation – or any other meditation practice - is less important, or that tantric yoga meditation in someway leads to superior or higher states. In fact, I believe that all spiritual teachings could quite possibly lead to the same ultimate insights and states of consciousness. However, examining other meditation methods in this way would require another dissertation; therefore, I am focusing on this one tantric yoga meditation method.

Comparative Analysis between Etic Neuroscience and Emic Tantric Yoga Views of Meditation

At the heart of this study is the core idea of yoga that meditation transforms the psychology of the practitioner. Anantharaman (2007) writes that the primary aim of yoga is to allow the spiritual transformation of the practitioner so that their normal sense of self is replaced with a broader identification with god. At the root of this idea is that in yogic meditation, practitioners cease to identify with external ordinary identities such as “I am a father (student, lawyer, etc.)” or “I am angry (scared, happy, etc.)” and instead get in touch with an “I” feeling that transcends all social roles and momentary experiences. From this teleological perspective, yoga has a goal; this state of enlightenment is the goal of yoga. It is said that suffering is alleviated through the yogic process and reaching this end goal (Feuerstein, 1998).

Realization of this goal is experienced as "absorption," but explained differently in science and yoga. Yoga explains that, during absorptive meditation, the degrees of substance - that are manifested forms of consciousness in this theory – undergo subtle transformations. The ‘substance’ that is transformed pertains more specifically to the meditator’s mental being and, in yoga, it is described in terms of a mental body referred to as a “subtle body.” This special transformed state of yoga – embodied spiritual knowledge – is understood to have metaphysical significance. However, explanations about the transformed state vary among models from the yogic perspective and the neuroscientific explanations of meditation. Numerous mental processes are also involved in scientific explanations of the shift from an ordinary state of consciousness to a

meditative state, but the models of body and mind are distinctly different. Whereas in yogic theories, models are claimed to have been developed based on some experiential insight and knowledge as well as philosophical discourse, scientific models are developed through objective observation and experimentation. Moreover, in scientific accounts, changes in physiological functioning of bodily organs and brain activity are the focus of explanation rather than advancing an understanding of some metaphysical reality or phenomenological state, as in the case of yoga. Physical mechanisms are the primary phenomena of experimental interest, and then descriptions of these mechanistic actions are interpreted as the causes of mental phenomenon or states of consciousness experienced during meditation. Therefore, there are significant gaps or differences between the analytic models employed by yoga and neuroscience and the goals of analyses.

Alter (2004) and others (e.g., De Michelis, 2004) have examined such gaps from various ethnographic perspectives. Alter focuses his study on emic and etic perspectives as opposing myths, and both Alter and De Michelis alert us to a potential confusion that occurs through the translation process of concepts with metaphysical meaning from the yoga perspective into ones that account for only physiological function from a scientific perspective. Alter believes that the hope or belief from the scientific perspective is that the scientific study of meditative phenomena will reveal the (or some) "truth" about yogic power or human nature. However, he argues that pursuing science to examine these particular sorts of phenomena (i.e., absorption) results in a unique confusion. Because the emic and etic perspectives pursue different kinds of knowledge and experience (in that science pursues objective facts about the world whereas yoga pursues subjective

knowledge about one's ultimate relationship with the cosmos), the scientific study of yogic phenomenon results in a kind of knowledge that is neither subjective nor objective, and neither physical nor metaphysical. Therefore, Alter believes that the "truth" of yogic experience cannot be known by either scientific, philosophical, or religions paradigms.

Alter (2004) suggests that an overarching philosophical perspective gleaned from twentieth-century literature on Yoga philosophy (e.g., Dasgupta, 1920; Feuerstein, 1998; Whicher, 1998) could be used to clarify many of the confusions between Yoga and science (although he takes a different course). I have taken a cue from Alter to also take account of the differing philosophical paradigms between Yoga and science. However, like Alter, I do not take a straight philosophical approach. Instead, I grapple with the conceptual understandings from each system that relate most directly to mental processes of meditation and analyze ways in which understandings from each system compare with the other. A particular focus of my analysis is the modern shift towards viewing yoga philosophy epistemologically instead of ontologically (see Bastow, 1980; Chapple, 1994). This perspective diverges from that assumed in the late nineteenth and early twentieth centuries by emic thinkers and researchers, such as Vivekananda and Swami Kuvalananda who based their work on an assumption of ontological truth (De Michelis, 2004). As Alter and De Michelis have explained, such attempts have resulted in a false (or confused) empirical understanding of the material manifestation of a cosmic principle. My approach is an attempt to clarify some of the confusions that have occurred over the past century due to efforts to translate yoga into the language of science that has arisen, in part, out of this confused cross-paradigmatic understanding.

The goal of this dissertation is to examine the tension between tantric yoga as a philosophy of knowing (perhaps close to phenomenological intellectual movements) with the rationalism of science as a philosophy of knowing, with the stated explicit special focus on models of mental processes involved in meditation. A fundamental or guiding question of my comparative analysis, then, is to examine this tension between two philosophies of knowledge. A basic motive of this project is to further integrate an understanding of meditation and Indian psychology into current academic understandings of psychological processes by comparing these two perspectives on what happens during meditation.

My method is to first examine neuroscientific evidence from a variety of meditation techniques that all can be seen as tantric in some way; that is, they involve mantra and/or visualization. This analysis will develop a neuroscientific perspective of *ishvara pranidhana* meditation. Then I will analyze *ishvara pranidhana* in the context of tantric yoga and the problems of understanding *ishvara pranidhana* as a modern tantric yoga meditation practice. These analyses will result in a discussion of the similarities and differences I find in a comparison between how the two systems explain how sustained attention during meditation leads to a particular emotional state of mental quiet. Thus, this dissertation examines the mental processes involved in meditation from within and without – from within the linguistic, conceptual, and philosophical frameworks, and targeted inner experience of the practitioner from a particular tantra yoga meditation tradition, as well as from the outside view of science looking objectively at the brains and bodies of people practicing meditation.

Overview of Dissertation Chapters

A primary aim of this dissertation is to examine the neuroscientific and yogic perspectives of the mental processes involved in changes in consciousness and well-being associated with meditation. Chapter two begins the process of defining meditation. It identifies important features of meditation that help distinguish between different tantric meditation techniques, positions the technique of *ishvara pranidhana* within the set of similar tantric yoga meditation techniques that have been studied using neuroscientific methods, and further defines the phenomenon of meditative absorption in a way that will be analyzed from the emic and etic perspectives throughout the rest of the dissertation.

Chapter three views *ishvara pranidhana* through the lens of neuroscience; it presents empirical evidence relating to meditation and about neuroscientific explanations of absorption during meditation. In this chapter, I discuss the "facts" about changes thought to occur in the body that are associated with meditative states and raise questions about how we should consider these characterizations of meditation, especially given limitations in research methodology and theories. I examine existing neuroimaging, and additional neurophysiological data – such as findings from electroencephalogram (EEG) studies - related to meditation and focus on structural and functional perspectives on the nervous system most directly relating to absorptive meditation. In the end, I propose three mental processes that seem appropriate as focal points for comparison with tantric yoga perspectives on meditation processes and discuss theoretical issues of studying meditation.

Chapter four contextualizes *ishvara pranidhana* in the classical and tantric traditions as a theistic meditation. In doing so, I explicate meditation processes from

these traditions that seem conceptually similar, at least in some basic way, to the mental processes determined in chapter three. I discuss traditional approaches to yoga and tantric views on subtle physiology and raise questions about how we should interpret these theoretical and practical methods of understanding yoga today. I argue that we should remember and understand these models of meditation in their intended context as tools to aid practice. Because of this context I suggest that we see emic models today more as phenomenological descriptions rather than as literal propositions about the body.

In chapter five I discuss modernizing forces and translations that attempt to merge emic and etic accounts of yogic absorption and that have contributed to an overall confusion regarding the nature of meditative absorption within the modern scientific milieu. I analyze *ishvara pranidhana* within this context and assert that a comparison of the two models must focus on the realities depicted by each model.

In part three, I analyze three key meditation processes by comparing these processes from each perspective with the other. I examine conceptualizations of these processes and explications of various mechanisms, and consider implications of the similarities and differences between the two perspectives. Chapter six focuses on understanding the process of concentrating attention on the abstract reality of *ishvara*; chapter seven examines the role of memory and knowledge in emic and etic accounts of absorption; and chapter eight examines emotional processes of meditation from both perspectives.

I conclude the dissertation with a discussion of a way forward in efforts to theorize meditation given our current culture that values both science and spirituality, arguing that we see physical changes in the body as necessary conditions for meaningful

experience, but not as causal. Moreover, we must view the transformations involved in yogic absorption in terms of an embodied cognition because this perspective has the potential to account for both the physical and experiential nature of meditative consciousness.

Chapter Two

Defining Absorptive Meditation

and Anandamurti's Tantric Yoga Meditation Method of *ishvara pranidhana*

What is Absorptive Meditation?

When people practice absorptive meditation, they take actions to reduce the mind's responsiveness to external stimuli that habitually capture awareness and aim to experience the present moment. Typically, meditators move to quiet environments, sit in specific postures, close their eyes, shift attention to their internal environment, and focus their awareness on some aspect of their inner experience. These processes induce a mental state of relaxed awareness, or "meditation." Although there are other types of non-sitting meditation, such as t'ai chi moving meditation, and altered "meditative states" through practices such as drumming, I do not consider these non-sitting methods in this dissertation and instead focus on sitting absorptive meditation.

Meditation practices from the yoga traditions are practiced and studied widely throughout the world. These yoga traditions reach far into history, with Indian religious texts and historical eras delineating numerous distinct traditions that all hold meditative practice as central to spiritual development. Within the first two sentences of his famous text, *Yoga: Immortality and Freedom*, Eliade (1958) identifies yoga as one of the four basic and interdependent concepts of Indian spirituality. He explains that the *word* yoga designates any method of meditation while the *name* Yoga designates a particular Indian system of philosophy or school of Indian thought, known as Classical Yoga and famously expounded by Patanjali in his *Yoga Sutras* (the main text of Classical Yoga). Thus, the

term yoga can be used to indicate any method of meditation. Indeed, in addition to Classical Yoga, Eliade (1958, p. 4) explains that there are countless forms of "popular" nonsystematic yoga, Buddhist and Jain forms of yoga, and, most importantly for this dissertation, there are yogas whose structures are considered "magical" and/or "mystical." I follow this system of using the capitalized term Yoga to refer to the Classical Yoga historical tradition throughout the dissertation, while lower case yoga indicates yogic meditation generally.

The term absorptive meditation evokes this broader sense of yoga, the sense that "yoga" or meditation encompasses forms of meditative practice that reach beyond the scope of Classical Yoga, and includes meditations from, for example, the tantric and non-Brahmanic yogas of Buddhism. Meditation techniques from these yoga traditions can be classified together and typified as absorptive meditation because of their similarity in emphasis on the experience of absorption. Absorption is a period of "total attention" that modulates how we represent experience, leading to altered perceptions of self and reality (Cahn and Polich, 2006). Thus, absorptive meditation techniques lead, ultimately, to first-person experience of absorption.

This state of consciousness in deep meditation is known in yoga by the Sanskrit word *samadhi* or absorption (Miller, 1995). The phenomenon of absorption or *samadhi* (meditative consciousness) is the focus of this study. The yogic term *dhyana* or absorptive meditation captures this *samadhi* experience of the meditator's mind becoming absorbed into a reality that extends beyond the boundaries of what are typically conceived as the meditator's own, an experience yogic literature and practitioners contend is attained by employing certain specific meditation techniques of the yoga

traditions. *Samadhi* (meditative consciousness) generally emphasizes the experience of the meditator's consciousness becoming absorbed into an inner object of awareness.

Two Paths of Absorptive Meditation: Object and Objectless

Of the many techniques for absorptive meditation, these techniques generally fall into one of two broad categories: object or objectless meditation. Recently, some scholars have adopted the analogous categories of focused attention and open monitoring (respectively to object and objectless) to characterize the meditative task (e.g., Lutz, Slagter, Dunne, and Davidson, 2008). Both kinds define the mental task of meditation in terms of attention and awareness, and have a goal of quieting the mind.

Object meditation involves concentration of the mind on some specific object, such that one actively directs the flow of the mind towards this object. Meditation occurs when the practitioner actively concentrates all attentional resources to the object of meditation such that his or her mind flows only in that direction, and this action leads to absorption. The intention is to let go of all thought so that the meditator can achieve a state of concentration by focusing on the object. It is typical in many yogic meditation traditions, including Yoga, for this object to be a mentally repeated sound, called *mantra*, or an abstract visualized image, with spiritual meaning such as a concept of god or a relationship to some divine source of being (Oberhammer, 1989; Feuerstein, 1998).

Objectless meditation involves concentration, but not concentrating on any object in particular. This meditative state occurs during moments of detached observation of (either or both) the external and internal worlds, such that flow of mind is not actively directed. Instead, meditators become aware of and detach attention from their own

reactions to objects arising in mental awareness or consciousness. Awareness of external or internal happenings may come to the forefront of consciousness, but meditators remain in a state of simply observing or witnessing these events rather than allowing mental processes to engage. In yogic meditation, the central task is the act of witnessing one's self in the absence of any objects of experience.

Meditation is practice; it is a process of training the mind. Such training requires concentration on the task, and achieving concentration is central for any meditation practice. In this sense, concentration means continuously paying attention though not necessarily thinking. Yet avoiding distraction from objects of perception can be difficult for either object or objectless tasks, both in terms of the technical aspects of the process of concentrating the dissipated mind and in terms of the psychological realities involved in concentration on tasks. The mind has objects in the form of thoughts about the past and projections into the future, and emotions about these. It has perceptions. The challenge of concentration is to focus attention on one thing, even if that one thing is nothing. The goal of spiritual yogic meditation is to focus one's mind on one's own eternal nature or soul. In the case of *ishvara pranidhana* meditation, the meditation task is dedicated to concentration on the thought that one's self or nature is like that of ultimate reality or *ishvara* (god). But concentrating on one's soul or "unmanifest nature" can be quite abstract for many people, and therefore difficult (*Bhagavad Gita* 10:5), and this difficulty can bolster unwanted thinking. The easier method of meditation can be to focus the mind on some object - an external or internal object - with or without spiritual significance. Therefore, many meditation practices include stages of object and then objectless meditation, because it is difficult to drop straight into objectless meditation – a state of

"witnessing" or "observing" - without first concentrating the mind, and using an object helps achieve concentration. Thus, many types of meditation each create concentration and cultivate the feeling of absorption.

Scientific Study of Meditation and Some Examples of Absorptive Meditation Techniques

Yogic literature abounds with descriptive accounts from yoga meditation practitioners' experiences in absorptive meditation. Yogananda (1956) describes his experience as an "active calm." Vivekananda (1896) explains that when a practitioner is in the absorptive state, there is "no feeling of *I,* and yet the mind works, desireless, free from restlessness, objectless, bodiless." Countless other examples exist that describe the yoga meditative state of mental quiet and mystical experience. Scientific researchers examine these phenomena from multiple angles with different research methods.

In their social-scientific study of the psychological dimensions of meditation, Osis, Bokert, and Carlson (1973, pp. 18-19) characterized "self-transcendence" as one dimension. In this dimension, meditators may experience "the usual sharp boundaries around the self [as becoming] diffuse or even…non-existent." Their subjects reported that they felt "a closeness," "dissolved boundaries," and "merger with others." Osis et al. (1973, p. 19) explain that in a spiritual meditative state, "the tight psychophysical unity of personality" is said to become radically altered such that the self is suddenly perceived as no longer identical with the body. This illustrates the "sense of disembodiment" described by people who have had mystical experiences from practicing meditation for spiritual purposes.

The scientific research literature on meditation also considers several meditation practices explicitly aiming towards absorptive meditation, including several forms of tantra. I have located numerous (20+) physiological and psychological research studies on Transcendental Meditation (TM), three studies of yogic absorptive meditation, two studies of Ananda Marga (i.e., Anandamurti's *ishvara pranidhana*), and one neuroimaging each on Kundalini and Tibetan Buddhist meditation. These are each examples of tantra because of their use of mantra and/or visualization. That these techniques are tantric has been established in one of two ways: either the originator of the technique has described the tradition as tantric or scholarly work has described the tradition as such. Presumably, despite the wide variety of techniques among yogic methods of absorptive meditation, any meditation method may be at least a sufficient pathway towards the yogic goal of Self-realization (Yoga Sutra 2.4, Miller, 1995). Therefore, choosing any one of a number of absorptive meditation practices could potentially advance an understanding of the yogic process and ultimate state of consciousness. Consequently, throughout this dissertation, I draw from findings about these practices to characterize an overall picture of *ishvara pranidhana* absorptive meditation, specifically focusing on similarities between these other meditation techniques and *ishvara pranidhana* itself.

The yogic meditation practice known as Transcendental Meditation (TM) involves quiet sitting and mental repetitions of a mantra. Maharishi Mahesh Yogi, the founder of the TM method of meditation, describes meditation as the "turning of attention inwards towards the subtle levels of a thought until the mind transcends the experience of

the subtlest states of the thought and arrives at the source of the thought" (Hjelle, 1974, p. 623).

In Kundalini Yoga meditation, a Tantric Yoga practice, practitioners "passively observe their breathing and silently [and actively] repeat a mantra (a special sound with a specific meaning)" (Lazar et al., 2000, p. 1052). The aim of this practice is to release the Kundalini energy from the base of the spine so that it rises to the top of the head.

One Tibetan Buddhist form of meditation has "practitioners initially focus their attention on a visualized image and maintain that focus with increasing intensity…" ultimately attaining a "peak experience." This experience is "described as a sense of absorption into the visualized image associated with clarity of thought and a loss of the usual sense of space and time" (Newberg et al., 2001, p. 114). As an expert scholar on medieval tantra, White (2000) authoritatively writes that Tibetan Buddhism is a tantric tradition by definition.

The Ananda Marga method of tantric yoga meditation, *ishvara pranidhana*, involves "intense concentration of attention and the subjective sense of an ongoing struggle to achieve the ultimate union with the object of concentration and total self-absorption (*samadhi*)" (Corby et al., 1978, p. 572). This method also involves silent repetition of mantra and attention to a visualized ideation. I will elaborate on this method in greater detail throughout the following chapters, since *ishvara pranidhana* is the focus of this study. Still, a basic orientation to the technique itself, and the mental processes involved in its practice, follows.

Anandamurti's Absorptive Meditation Method of *Ishvara Pranidhana*

Moving forward from more general descriptions of tantric yoga meditation practices, we will now turn to defining meditation in terms of the specific practice of Anandamurti's method of *ishvara pranidhana*. In developing this description, I drew from the literature's description (the literature on Yoga, tantric yoga, scholarship specifically on *ishvara pranidhana*, and Anandamurti's own writing) as well as my own interpretative description of these sources informed by my practitioner perspective of the instructions as they are taught within Ananda Marga. This approach yields a sort of phenomenological description of the *ishvara pranidhana* practice that will then be analyzed throughout the rest of the dissertation from the emic and etic perspectives.

According to Anandamurti (Sarkar, 1959), who also goes by the name P. R. Sarkar, the purpose of yoga is unification. In this view, the meditator aims to unite his or her individual self or consciousness with that of god, or ultimate reality. To achieve yogic unification, *ishvara pranidhana* meditators are instructed to shift their attention away from awareness of happenings in the external environment "outside" of oneself, and turn awareness inward. Meditators attempt to perceive their inner nature. This mental process leads to the yogic experience of "merger," "absorption," and "oneness." Anandamurti (1959, p. 63) writes that "unification of the unit self with the Cosmic Self is yoga. When your little 'I' becomes one with your great 'I,' that state is the state of yoga." The tantric elaboration of yogic meditation practice grounds psychological transformation and experience of "absorption" - that is, of the individual's consciousness merging or becoming one with "the cosmos" - in the body. The biopsychological processes of this experience are explored in depth thoughout this dissertation. As a starting point, what

follows is a description of further basic mental processes of *ishvara pranidhana* meditation.

The yogic concept of *cittavrtti*, translated as mind's "turnings of thought" (Miller, 1995), "fluctuation of consciousness" (Feuerstein, 1979), or as mental "propensities" (Sarkar [Anandamurti], 1959), is central to understanding meditation. In waking states, the mind is constantly active in *cittavrtti* (mental fluctuations or activity). Attention moves from object to object, both sensory objects of perception as well as mental objects, for example, in terms of thoughts and memories. This movement is the mind's propensity for activity. During meditation, this propensity, or these mental 'turnings,' cease as the activity of mental processes quiets. The main point here is that overcoming the propensities of mind and their modes of fluctuation in mental processes is at the heart of yogic practice and *ishvara pranidhana* meditation, and constitutes what Whicher (1997) calls "yogic praxis" or the transformation of the self. In this praxis, *cittavrtti*s are states of consciousness, and the states of consciousness of the various *cittavrtti*s (mental activities) become restricted and the mind no longer operates in its normal modes. Thus, the yogic experience begins with a state of *nirodha* (cessation), a state in which the normal states of consciousness are suppressed or suspended.

The yogic word for meditation is *dhyana*, though a more precise meaning of *dhyana* is a unidirectional mental flow towards the object of meditation (Anandamurti, 1962; Anantharaman, 2007). Yoga assumes that the nature of the mind is to move; it takes the form of whatever object or objects are in its field of awareness. So when the meditator moves attention away from awareness of the external happenings and instead turns to perceive internal events, the mind is still active because it moves in the various

directions of whatever internal objects continue to drive the mind, such as thoughts and memories. However, during the yogic meditation of *ishvara pranidhana*, when the meditator focuses all of one's attention on the object of meditation, this concentration process moves the *citta* (mind) in that single direction. Complete concentration is thus a means of quieting the mind from any distractions, external or internal.

Anandamurti bases his method of *ishvara pranidhana* meditation not only on the notion that meditation on an object is the best route to achieving concentration, but also on the pivotal teaching that the object of meditation is crucially important. For any practice of *ishvara pranidhana,* the object of mental focus and awareness is *ishvara* or god (Pfleuger, 2005). In addition to its translation as lord or god, Anantharaman (2007, p. xi) describes the concept of *Ishvara* or *ishvara* (at least in Yoga) as "analogous with the Supreme Reality, the Absolute, or Brahman," and asserts that this reality is "both material and spiritual, under different aspects, and that ultimately these two aspects (material and spiritual) are identical." These ideas about *ishvara*, as the object of meditation, in terms of the Absolute or Ultimate Reality are central to understanding the non-dual and mystical associations attributed to *ishvara pranidhana*.

During normal mental states, the mind takes in or perceives a vast spectrum of finite objects, events, ideas, and more. However, during meditation when the object of perception is *ishvara*, the mind contemplates an infinite reality. Because the mind has its own limits and boundaries, the act of contemplating this infinite idea (of *ishvara*) gives the mind some object bigger than itself to move towards during meditation. Anandamurti asserts that focusing on something bigger than itself is the only way the mind can expand. During meditation as the mind continues to contemplate this infinite reality of *ishvara*,

eventually the limits of the individual mind dissolve and what is left over is the contact: the merged or mingled reality between the individual's self and *ishvara*. In this moment, the object becomes the subject. It is this "subjective" knowledge that is recognized by some as mystical. An examination of this moment, its processes and state, could help bridge representational approaches for orienting to, describing, and explaining the world with non dualistic approaches. Let us look more closely at the meditation processes involved in *ishvara pranidhana*.

The goal of realization to be attained during *ishvara pranidhana* meditation is this essential identity between individual consciousness and god consciousness. Encountering knowledge of *Ishvara* (god) is the primary goal of *ishvara pranidhana* meditation.

To gain this knowledge, the book Yoga The Way of Tantra (1983) prescribes that to practice *ishvara pranidhana,* meditators should focus on the spiritualized meaning of the mantra as they continuously repeat it and also concentrate attention on a specific visualization process that culminates at a particular *chakra* (energy center). These actions are thought to withdraw or decouple the mind from perception of both external and internal happenings and "purify" it from residual mental experiences left over from prior perceptions (later we will examine what exactly purification means in this context).

More specifically, there are five stages of Anandamurti's *ishvara pranidhana*: proper *asana*, *bhutasuddhi*, *asanasuddhi*, *cittasuddhi*, and then *samadhi* in *dhyana* (meditation) (Yoga the Way of Tantra, 1983). To put it another way, the meditator must be in a meditative posture and achieve three stages of mental purification before actually attaining any degree of absorption (*samadhi*).

The first stage of Anandamurti's *ishvara pranidhana* meditation begins after practitioners place their bodies in comfortable meditative postures when they focus attention to the mental task of reciting the mantra. Practitioners recite their personal mantra over and over as a way of focusing and concentrating the mind. This way of using mantra is the extent of the technique considered by much of the scientific literature on meditation that uses mantra (e.g., Lutz, Dunne, Davidson, 2007). However, according to Anandamurti, the practice of *ishvara pranidhana* takes conscious awareness beyond this basic stage of concentration.

The next stage of *ishvara pranidhana* involves the practice of *bhutasuddhi* (purification of the elements), a practice which aims to withdraw the mind from the external world. It begins as a visualization of oneself seated on top of the planet, which involves gathering worldly thoughts or propensities of the mind and pulling them inward. Essentially meditators identify each thought with the mantra as the focus of meditation. Soon, the visualized image of the globe dissolves into a visualization of oneself floating alone in the universe. Mantra recitation continues in one's consciousness to further focus and concentrate the mind, leading to deeper absorption. Finally, the visualization of oneself dissolves into a point of white light. As the mind continues to concentrate, thoughts, energy, and the general "flow" of mind begin to flow in a unified current. After the visualization turns to a point of light, practitioners move into the second purification practice: *asanasuddhis*.

In the practice of *asanasuddhi*, meditators withdraw the mind from its attachment to the body by visualizing the point of light moving through each part of the body, starting from the toes and moving upwards through the legs and up the spinal cord. This

purification practice highlights a uniquely tantric facet of transformation. Tantra elaborates on Samkhya-Yoga philosophy by prescribing practice techniques built on Samkhya's idea that universal elements are located in the body (Rastogi, 1992). As will be elaborated in later chapters, in Samkhya-Yoga philosophy the mind evolves from the interaction of *purusa* (consciousness) and *prakrti* (matter). Anandamurti (1962, p. 32) explains these universal elements in Samkhya-Yoga's evolutionary philosophy that are manifested in each individual's body as follows:

> By further crudification the *citta* [mind] gets metamorphosed into five fundamental factors, namely, ethereal [space], aerial [air], luminous [fire], liquid [water], and solid [earth]… [thus] … as the subtle elements give rise to the gross elements, so the gross or physical body can be seen as an emanation of the subtle. … As in the Upanishads (e.g., Chandogya Upanishad 8.1.3), the universe is here contained within the body.

These five elements are located within the body, specifically within the spine, and are central in *ishvara pranidhana*. The visualization continues as the mind's focus moves from element to element as it moves up the spine. To complete asana *suddhis*, the mind focuses and localizes inner attention to a specific *chakra* called the *ista chakra*, so as the meditator raises the mind up the spine, the mind comes to rest on this *ista chakra* (personal energy center). In Anandamurti's system, the *ista* mantra (personal mantra) and *ista chakra* (personal energy center) are assigned by the meditation instructor according to the particular propensities of the meditator. Once the mind rests on this spot, the meditator begins the third and final purification process: *cittasuddhi*.

With the mind finally concentrated on this particular spot of the *ista chakra* (personal energy center), the meditator practices the deeper purification of *citta suddhi* by withdrawing the mind from thoughts. Here the mind becomes absorbed in its object of

meditation – the thought of the mantra: *ishvara* or *parama purusa* (god); essentially, when the mind rests on its *ista chakra* (personal energy center for meditation) it becomes absorbed into cosmic consciousness. Anandamurti's meditation method involves sublimating the thoughts by consciously identifying with *ista* or *ishvara* (god). Focusing mental activity at the specific *chakra* center helps the meditator to internalize consciousness and that this internal focusing process clarifies one's perception of *ishvara* within. Eventually this sublimation of thoughts during *dhyana* (meditation) leads to "*samadhi*" – or absorption, the goal state of consciousness during meditation. Numerous stages of *samadhi* have been described in yogic literature (Feuerstein, 1979; Miller, 2004). Anandamurti's *ishvara pranidhana* contends that his method of *ishvara pranidhana* leads to one of the highest states of *samadhi* (meditative consciousness), and this is the state of meditative absorption that is the focus of this study.

PART II

Chapter Three

Neuroscience Perspectives on

Absorptive Meditation and *Ishvara Pranidhana*

In this chapter I pursue two questions about meditation. What knowledge about meditation have we derived from studying the meditating brain? What are the limits to this kind of approach to studying meditation and its knowledge for explaining meditation? First, this discussion focuses on studies that have examined brain or body changes in *ishvara pranidhana* or similar meditation practices (in technique and/or goal of a meditative state of absorption). In addition, some consideration is given to limitations of various neuroscientific research methodologies and resulting limitations in inferences about mental processes of meditative phenomena.

Introduction to the Neuroscientific Study of Meditation

Recent reviews of neuroscientific studies of meditation (e.g., Cahn and Polich, 2006; Lutz, Dunne, and Davidson, 2007) have noted that despite the large number of scientific studies and theoretical proposals that have been made (a PubMed search of the term "meditation" in late 2009 turned up over 1700 results dating back to 1951), still little is known about the neurophysiological processes of meditation. These reviews cite problems in the heterogeneity of meditative states studied and the lack of adequate control conditions, as well as the lack of scientific rigor of many early studies. Perhaps it is the case that the research methods and measurement devices have yet to identify what needs to be measured to learn more about meditative absorption. Despite these problems,

I argue here that the evidence from neurophysiological and imaging studies of meditation practices similar to *ishvara pranidhana* seem to support the idea that the shift to the meditative task functionally activates specific structural connections or circuits in the brain during the meditation period, although evidence suggests that there are not uniform circuits active throughout various stages of each meditation methods. These changes catalyze the downstream effects (those effects that are observable in lower brain regions and throughout non-neural tissues in the body). Such neural activation may also form new structural connections in the brain because of long-term effects that persist over time, and regular meditative practice might enhance these long-term effects.

Scientific study of changes in the body during meditative practice started in the west around the mid-twentieth century. Some earlier attempts at scientific study of yogic practice, including meditation, were made in India starting as early as the 1920s, but these studies have a somewhat different character than the Western study of meditation (see Alter, 2004, 2005). This topic is discussed in chapter five on the phenomenon of Modern Yoga. However, both approaches have the common theme of theorizing yoga (or meditation) in terms of rational, scientific principles, and have some objective to prove the efficacy of yogic practices. Here we focus on drawing out this rational objective perspective on what happens in the brain during meditation.

Early studies of meditation in the west aimed to characterize physiological changes in bodily functions such as heart rate and respiration (e.g., Bagchi and Wenger, 1958) and also used electroencephalogram (EEG) recordings to infer qualities of mental states during meditation (e.g., Das and Gastaut, 1955; Wenger and Bagchi, 1961). These lines of research continued in the 1970s, with many psychological and physiological

studies on meditation attempting to replicate and extend earlier findings, including further study using EEG methodology. A number of studies from this period used yogic or Buddhist meditations similar in technique and desired meditative state to tantric *ishvara pranidhana* practice or used the *ishvara pranidhana* technique itself.

In recent years, a renewed interest in the empirical scientific study of meditation has grown, with this new wave of science focusing especially on the brain through refined use of the EEG and imaging methods. For historical perspective, note that the EEG was first used in 1929 by Hans Berger who reported the presence of several brain rhythms in the EEG signals, while magnetic resonance was theorized as early as 1946. However, the first fMRI machine only became a method of mapping the function of the brain in the early 1990s (Cacioppo, 2007) and this new technology has revealed knowledge about the brain that was previsously not available. Imaging methods are used to help identify structural areas of the brain that are functionally activated, both electrically and hemodynamically, during meditative practice.

However, even with this emerging line of knowledge regarding brain areas whose activity is associated with meditative practice, there is still no brain-based theory of meditation. For example, one of the primary unresolved questions about neural activity during meditation is whether it reflects a unique state, some underlying trait related to awareness or consciousness, or perhaps both (see Cahn and Polich, 2006). Related to this state versus trait problem is the paradoxical subjective reporting of both calm/relaxed and alert/ecstatic qualities present during meditative states. A brain-based theory must account for the physical evidence that supports each of these states and the more stable features of the brain that might be associated with regular meditation practice. Moreover,

if meditation is a state, theorists must explain if meditation ought to be understood fully in terms of a physical state because whether a brain-based theory of meditation could explain the supposed psychological traits remains controversial.

For background information readers may refer to Appendix A for a general orientation to the structure and organization of the nervous system. This appendix identifies specific cortical and subcortical structures, provides a basic introduction to nomenclature, and presents a brief overview of the operations at the synapse between two neurons.

Imaging Evidence for a Neurocircuit of *Ishvara Pranidhana*

Even though, at this point, neuroimaging studies on meditation are typically more exploratory than hypothesis-driven, some progress has been made in identifying changes in the activity of multiple brain regions during meditation using imaging methods (Lutz et al., 2007). This progress should be viewed as extending neuroelectric findings on meditation because the imaging methods are able to more sensitively detect and localize brain activity (Cahn and Polich, 2006).

Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI) (and related methods such as single photon emission computed tomography (SPECT) and functional magnetic resonance imaging (fMRI)) are the primary imaging methods used in neuroscience research settings to study meditation (these research methods are reviewed in Cacioppo, 2007). PET scans produce images of the distribution of chemicals throughout the brain and body using various radioactive tracers. For example, PET can reveal blood flow, oxygen and glucose metabolism, and neurotransmitter concentrations

in different regions of the brain and all of these measures reflect brain activity in these regions. Like PET, SPECT uses tracers injected into the body to produce images of neurochemical function in the brain, but with less spatial resolution than PET. Rather than using tracers, MRI relies on magnetic fields to produce detailed anatomical images of both surface and deep brain structures. FMRI methods generate images of both brain structure and its activity while the brain functions in real-time (by detecting its use of oxygen), thus helping researchers determine which structures are involved in various tasks. A new image is captured every second or two with fMRI whereas PET images are formed every several dozen seconds. Thus, MRI/fMRI can be more accurate than PET/SPECT because of better anatomical and temporal clarity, but PET can pinpoint which neurochemicals are involved in functional brain alterations.

It is also important to bear in mind that neuroimaging methods have a number of limitations that make interpretation of findings complicated, as discussed in a recent review by Logothetis (2008). For example, with fMRI/MRI imaging methods there is an implicit or explicit presumption that a change in the activity of neurons in the imaged region underlies behavior. For example, when scientists find area X to be activated by a task at hand, they might presume that the activity of the neurons in area X causes the task behavior. But such findings are correlative rather than causal and there is considerable discussion about what BOLD signals actually reflect. FMRI measures neuronal activity indirectly (as a result of oxygen use) and its relationship to neuronal firing patterns is rarely clear. In addition (and especially important for interpreting data from studies of meditation) it is not possible to infer actual mental function from human fMRI images. For this reason, a number of authors (e.g., Cacioppo, 2007; Logothetis, 2008) have

argued that findings from fMRI imaging of humans need to be interpreted in conjunction with animal model studies that identify cognitive and behavioral function relating to fMRI signals. Similar limitations exist for PET and SPECT methods (see, for example, Cacioppo, 2007). Therefore, although interpreting studies of meditation in conjunction with animal studies may prove less conclusive because of the nature of the meditation task, in part III of the dissertation I will consider some interpretations of animal studies as they may relate to human cognition. This avenue of anlaysis may lead to at least some useful discussions of brain function during meditation. All of the limitations discussed here need to be considered when interpreting results from imaging studies of meditation, and when attempting to use these interpretations to generate hypotheses about *ishvara pranidhana*.

Several imaging studies pinpoint numerous cortical and subcortical areas of the brain whose activity levels change during meditation practices similar to *ishvara pranidhana*. Because of the similarities in practice technique between *ishvara pranidhana* and the methods chosen for discussion here, namely mantra and visualization, the brain activity associated with these other various meditative tasks are likely to change in similar ways during *ishvara pranidhana*. Table 1 below shows the numerous cortical and subcortical areas of the brain active during different absorptive meditation practices and these data suggests that there are no uniform circuits activated throughout various stages of practice during similar, or even the same, techniques. Various regions are activated and deactivated depending several factors, including the phase of meditation, the type of meditation method, the participants' degree of experience in meditation, etc. Yet there are some commonalities across most studies. For example,

most studies report activity in at least some area of the frontal lobes, especially the prefrontal cortex, for concentrating attention. Also, at least two studies report activity in the midbrain for motor behavior associated with motivation and emotion, hippocampus (whether for memory formation or recall is not always clear), and striatum for reward saliency. Below I briefly describe the results of individual studies followed by a synthesis across studies, focusing on ways in which the various meditation techniques at the heart of the studies are similar to the absorptive meditation of *ishvara pranidhana*.

Table 1: Findings from eight neuroimaging studies of different techniques of absorptive meditation (adapted from Newberg, 2003).

Study	Meditation	Method	Findings
Newberg et al. (2001)	Tibetan Buddhist Meditation ** subjects each had 15+ years daily meditation training with this technique	SPECT – changes in regional cerebral blood flow	*baseline vs. meditative state*: a significant increase in regional cerebral blood flow (rCBF) in the **cingulate gyru, inferior and orbital frontal cortex, dorsolateral prefrontal cortex (DLPFC), midbrain, sensorimotor cortex, dorsomedial cortex and thalamus**
Brefczynski-Lewis et al. (2007)	Tibetan Buddhist focused attention meditation (Tse-cig Ting-nge-dzin) ** experienced meditators had greater than 10,000 hours cumulative meditation practice; control subjects had no prior meditation experience but given instruction and practiced meditation daily for one week before fMRI scan	Block design fMRI	controls: greater activation **of anterior cingulate cortex (ACC)** compared with experienced meditators; experienced meditators: more activation, especially in the **frontal parietal network**; both groups (experienced meditators and controls): activation of common areas of attention network, including **intraparietal sulci, frontal eye fields (FEF), thalamus, insula, lateral occipital, and basal ganglia**
Lazar et al. (2000)	Kundalini yoga Meditation **subjects each had 4+ years daily Kundalini meditation training	fMRI – changes in regional brain activity and blood flow	*control vs. meditation state*: increases in the **putamen, midbrain, pregenual anterior cingulate cortex, and hippocampal/parahippocampal formation**; increases were also found in the **septum, caudate, amygdala and**

Table 1: continued

			hypothalamus in at least three subjects; *early versus late stage*: increases in **prefrontal, parietal and temporal cortices**, **motor and somatosensory cortex, and hippocampal/parahippocampal formation, also increases in the amygdala, hypothalamus, and septum**
Lou et al. (1999)	Yoga Nidra **subjects each had 5+ years meditation training: Yoga Nidra, Kriya Yoga, and other yoga techniques	15O-H2O PET cerebral blood flow	meditation on *sensation of weight of limbs and other body parts*: increased activity in the **parietal and superior frontal lobes**; *abstract sensation of joy and happiness*: **left hemisphere, parietal, and superior temporal (**Wernicke area) activation; *visual imagery:* strong activation of the **occipital lobe** sparing V1 (not part of visual awareness), and **parietal lobe**; *symbolic representation of self*: **bilateral parietal** activity; *most*: strong **bilateral hippocampal** activation, **parietal and occipital sensory and associated regions**, again with **exception of V1**; ***resting state****:* **orbital and dorsal lateral prefrontal, anterior cingulated, temporal, inferior parietal lobule, caudate nucleus, thalamus, pons, and cerebellar vermis and hemispheres**
Lutz et al. (2008)	Buddhist compassion meditation **8 experienced practitioners (with between 10,000 – 50,000 hours over 15-40 years practice) compared with 8 age-matched healthy control volunteers with no meditation experience	fMRI	common activation: **striatum, anterior insula, somato-sensory cortex, anterior cingulated cortex, and left-prefrontal cortex**; deactivation: **right interior parietal**; activation of this pattern was enhanced in adepts as compared to novices.
Lazar et al. (2005)	Buddhist Insight meditation **meditators had on average between 7-9 years of practice experience; controls had no meditation experience	MRI	increased cortical thickness in **prefrontal cortex** and **right anterior insula** in meditators

Table 1: continued

Kjaer et al. (2001)	Yoga Nidra **subjects had 7-26 years daily meditation practice	PET – pathway of a tracer through blood flow in the brain	significant decrease in the binding (potential) of C11 raclopaide to D2 **dopamine receptors in the ventral striatum**
Herzog et al. (1990-91)	Yoga Meditation **subjects trained in meditation for at least one year	PET – rate of regional cerebral glucose metabolism	**no intrahemisphere asymmetry**; significant increases in the ratios of regional cerebral metabolic rate of glucose consumption (rCMRGlc) **between the frontal vs. occipital lobes and between the frontal vs. parietal lobes (anterior regions increased more than the posterior regions)**; overall global change of pattern of rCMRGlc

Visualization: Tibetan Buddhist Meditation

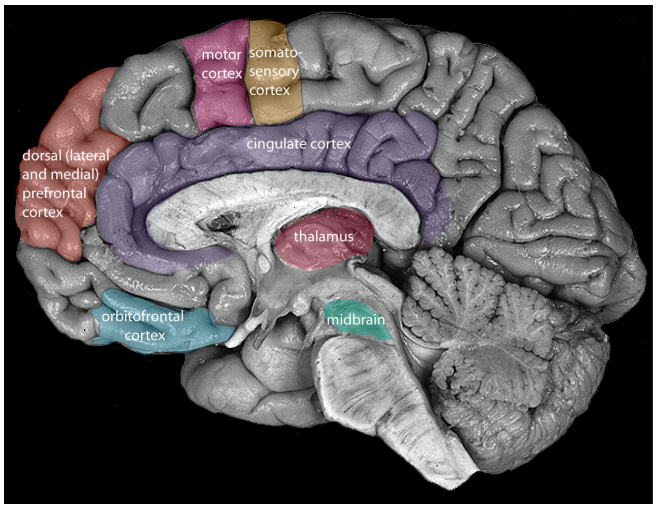

Figure 1: Tibetan Buddhist Meditation. The colored areas (*) of the brain represent brain areas activated during "peak" experiences during the visualization meditation, as measured by increased blood flow through the brain areas. Source: Brain image adapted (photoshop to highlight brain areas) from The University of Washington Digital Anatomist Image Collection Manager website: http://imagemanager.biostr.washington.edu accessed 6/15/06. (*) Note that this figure and the following figures in this chapter have different brain regions highlighted with different colors and that these colors are used only to define distinct brain regions and highlight those areas activated during specific studies, with no meaning of the colors beyond this.

Newberg et al. (2001) performed a SPECT study of one Tibetan Buddhist meditation technique similar to *ishvara pranidhana* in that both methods focus attention on a visualized image as the object of meditation and lead to the "peak" experiences of absorption. This state of absorption is described as, "a sense of absorption into the visualized image associated with clarity of thought and a loss of the usual sense of space

and time" (Newberg, 2001, p. 214; see also chapter two, pp. 32-35). The study imaged eight experienced Tibetan Buddhist practitioners who practiced daily for at least 15 years and underwent several three month retreats. Participants were scanned after about an hour of meditative practice when the subjects provided a signal to the researchers that they had entered the deepest phase of meditation. Baseline scans were also taken of nine normal subjects in the control condition. Newberg reported increases in the orbitofrontal cortex, dorsal lateral prefrontal cortex, motor and somato-sensory cortices, cingulate cortex, thalamus, and midbrain. Figure 1 highlights in color these brain areas, thus representing the functional circuit during this "peak" experience.

Lutz et al. (2007) point out the lack of "descriptive precision" given in the study by Newberg et al., arguing that this limitation makes it difficult to compare with other studies because of uncertainty as to the exact state of the measured "peak" experience. They argue that a number of different states could potentially fit the description of "clarity of thought." Descriptive precision is necessary for developing a brain-based theory of meditation because it provides necessary information about the phenomenon from which one can draw a hypothesis.

In a more recent study of a Buddhist meditation requiring focused attention to an external visual object (Tse-cig Ting-nge-dzin), Brefczynski-Lewis et al. (2007) conducted an fMRI experiment on experienced practitioners with greater than 10,000 hours of cumulative meditation practice. A control group that had no meditation training before the study received instruction in concentration meditation a week before being scanned. Both groups showed activation of common areas of attention network, including intraparietal sulci, frontal eye fields (FEF), thalamus, insula, lateral occipital, and basal

ganglia. However, Brefczynski-Lewis et al. report that experienced meditators showed more activation, especially in the frontal parietal network, and suggest that this activation pattern may be a neural correlate for these participants' expertise in sustained attention. In addition, the controls showed greater activation of anterior cingulated cortex (ACC) compared with adepts. Because the ACC has been implicated in conflict monitoring and error detection (Van Veen and Carter, 2002), the researchers make the reverse inference that this brain activation could reflect greater error proneness (i.e., distraction) and conflict monitoring in the controls than the adepts (conflict between instructions to focus and the difficulty in complying with such a request).

Mantra: Kundalini Yoga Meditation

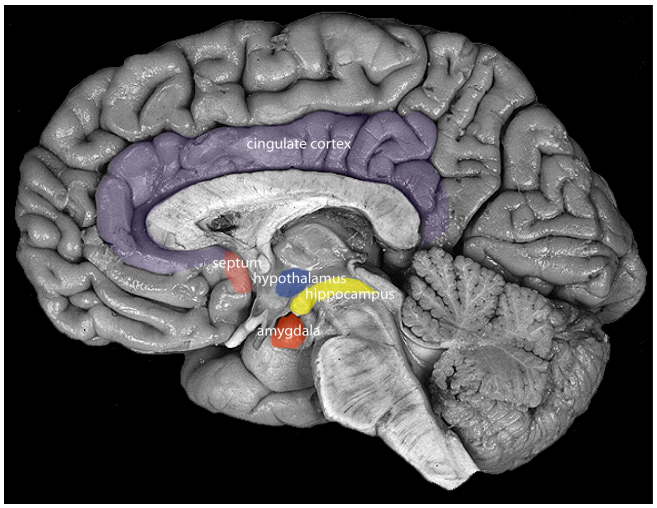

Figure 2: Kundalini Yoga - control vs. meditation. The colored brain areas represent areas of the brain active that became active from the control to the early stage of meditation: putamen, midbrain, pregenual anterior cingulate cortex and the hippocampal/parahippocampal region. Source: Brain image adapted (photoshop to highlight brain areas) from The University of Washington Digital Anatomist Image Collection Manager website: http://imagemanager.biostr.washington.edu accessed 6/15/06.

Lazar et al. (2000) used fMRI neuroimaging technology to study early and late stages of Kundalini Yoga meditation in meditators with at least five years of meditation experience. This meditation technique is similar to *ishvara pranidhana* in that both involve observation of the breath and ideation on a mantra. Because of this emphasis, Lutz et al. (2007) refer to

this meditation practice as an example of focused attention. A total of five subjects were scanned for 42 minutes with 12-minute meditation periods and 6-minute control periods before each meditation period and early versus late meditation periods were compared. During the control conditions, subjects silently generated a random list of animals and did not observe their breathing. Figure 2 shows the brain areas that became active in the early stage of meditation when compared to a control state, while Figure 3 shows the brain areas actived in the late stage of meditation when early-stage meditation is compared to late-stage meditation. The shift from early to late stage meditation reveals a shift away from activation of more sensory and movement oriented areas (such as the putamen and midbrain) towards directing attention to more abstract processing (prefrontal, parietal, and temporal cortices).

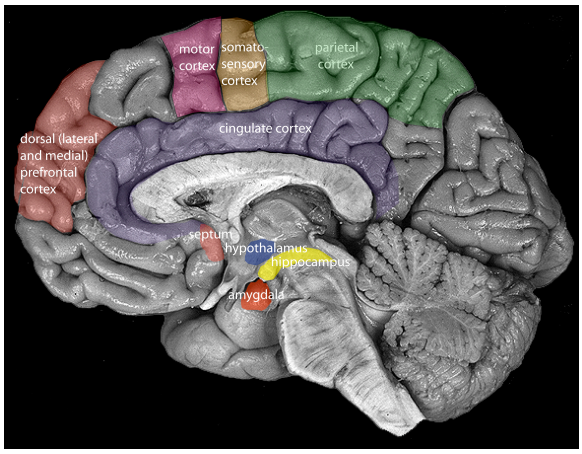

Figure 3: Kundalini Yoga - early vs. late stage meditation. The colored brain areas represent areas of the brain active when early stage meditation was compared with late stage meditation: prefrontal, parietal and temporal cortices, precentral and post central gyri, and the hippocampal/parahippocampal region. Source: Brain image adapted (photoshop to highlight brain areas) from The University of Washington Digital Anatomist Image Collection Manager website: http://imagemanager.biostr.washington.edu accessed 6/15/06.

There were some important differences between the brain areas active in the early versus the late stage of this meditation. One main difference is that the striatum (the caudate and putamen) is active during the early stage of Kundalini meditation but not active during the late stage. The caudate is known to assess stimuli, especially reward stimuli. So it could reflect that this assessing of stimuli function is more active in early stages of

meditation until the mind quiets its stimuli-related activity in later stages of meditation. Additionally, Lazar reports that in the later stage of meditation other areas become active, specifically the sensorimotor, parietal, temporal, and DLPF cortical areas. These areas are known to be involved in attention, sensory perception, and memory, especially the parietal and DLPFC (Posner and Snyder, 1975; Posner and Petersen, 1990).

A likely explanation of these differences in brain area activity between early versus late meditation phases relates to experiential differences between them. For example, in an earlier stage of meditation, practitioners might not yet be fully established in the meditation, reflecting the nuanced meaning of the term "meditation." To be "in meditation" could mean either that someone is actively practicing a meditation technique – but maybe not yet quite in a meditative state - or it could also mean that not only is someone actively engaged in the technique itself, but that the person has also achieved some target "peak" state of practice – concentration and quietness of mental activity. To the extent that it reflects mental states, neuroimaging evidence suggests that achieving a meditative state most typically occurs in later stages of meditation after the meditator has spent some time getting "into" the practice. This transition can often involving shifting the body and arranging oneself into a comfortable posture. So the measured differences in this study between early and late phases of meditation could indicate this further subtle shift between initial states of meditation and later "deeper" states. In an early stage of meditation, the mind is still restless and attention is jumping from object to object sometimes involving the body (putamen and midbrain). In later stages, sustained concentration is paid to contemplating and feeling the meaning of the mantra while the

mind and attention become selectively focused on this task (prefrontal, parietal, and temporal cortices), to the exclusion of attending to other stimuli.

Cahn and Polich (2006) describe fMRI findings from a conference presentation by Lazar et al. (2003) that examined Kundalini Yoga meditation and mindfulness meditation (Vipassana). These were compared with a control group, and the researchers also compared meditation with a non-meditation cognitive task (random number generation). These comparisons underscore the importance of understanding what state is the goal of any meditation, because small variances between meditation practices seem to differently affect the brain and non-meditation cognitive tasks may involve similar functions and brain areas as are involved in meditaiton. These sublties are all important to uncover. Lazar et al. reported that both meditation groups showed cingulate activation, the mindfulness (Vipassana) group showed right temporal activation, and there was a different activation of networks between the two groups. These findings support the idea that there is no single neurocircuit of meditation; rather, the neurophysiological correlates relate to specific aspects of particular meditative tasks.

Altered State through Visualization and Deep Relaxation: Yoga Nidra

Lou et al. (1999) studied the effects of several different components of the Yoga Nidra meditation by using PET. This study examined nine normal yoga practitioners with at least five years of experience in practicing various yogic techniques including Yoga Nidra. For two hours before arriving at the testing center, the participants practiced an intense form of a tantric yoga concentration meditation that is believed to detach the mind from thoughts of daily life and make the mind more susceptible to meditation. The first

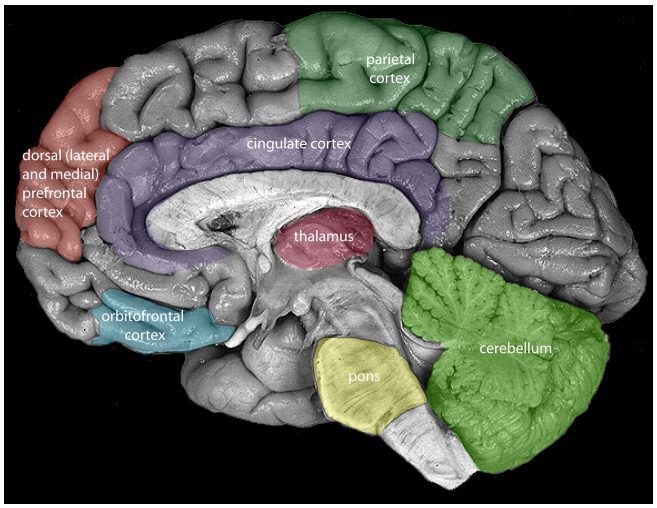

Figure 4: Yoga Nidra Resting State. This figure shows the brain areas active during the resting state of Yoga Nidra: the orbital and dorsal lateral prefrontal cortices, anterior cingulate, temporal, inferior parietal lobule, caudate nucleus, thalamus, pons, and cerebellar vermis and hemispheres. Source: Brain image adapted (photoshop to highlight brain areas) from The University of Washington Digital Anatomist Image Collection Manager website: http://imagemanager.biostr.washington.edu accessed 6/15/06.

measurement occurred during an awake state without meditation. Subjects then performed Yoga Nidra according to taped instructions for 45 minutes during which time several measurements were taken at appropriate junctures as the meditation activity switched from task to task. The sequence of measurements was not counterbalanced, and only the quiet non-meditation periods between meditative tasks were considered as control conditions. Figure 4 shows highlights of several areas of the brain that are active in the resting state. Although different activation patterns correlated with the timing of different phases of the shifts in the meditation practice, it is not possible from this study of brain states to verify whether the mental states theoretically attributed to the meditation technique were actually present in the person at the time of the activation.

Yoga Nidra is a meditation in which the practitioner is said to disassociate consciousness of the sensory world from consciousness of action such that the mind is no longer associated with the emotions or will. However, there are some important differences between this yogic technique and *ishvara pranidhana*. Both techniques employ visualization; but while Yoga Nidra removes imagery with emotional content,

ishvara pranidhana channels emotions from memories and latent experiences towards the visualization throughout most stages of the meditation. Visual imagery is evoked in Anandamurti's *ishvara pranidhana* while getting into the full state of meditation. In other words, *ishvara pranidhana* employs visualization throughout the initial attention focusing practice, throughout the *suddhis* (purification practices), and during the visualization of self as *ishvara*. Lou reported strong activation in the occipital cortex, though not in the V1 or the primary visual cortex involved in lower-level visual processing of raw data from the visual field, and the parietal cortex during visual imagery. See Figure 5, which highlights this general activation pattern (note that the figure highlights the entire occipital cortex in blue shading, but V1 is not part of this pattern). Therefore, these main areas of the brain activated during visual imagery tasks of Yoga Nidra, or perhaps more specialized subregions of these large general areas, could also be involved in visualization in *ishvara pranidhana*.

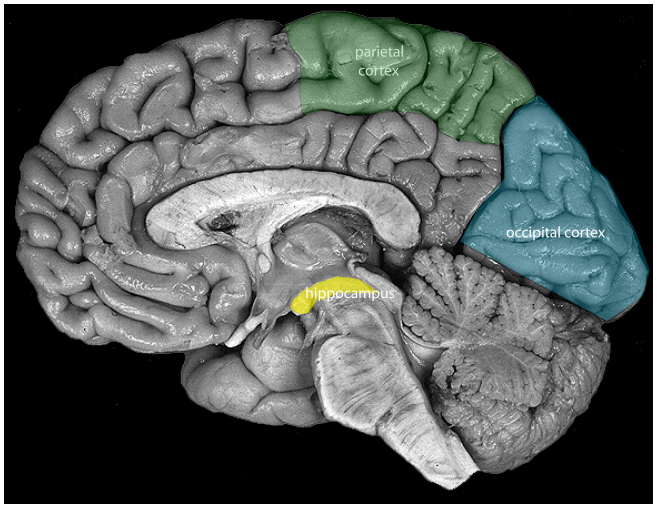

Figure 5: Yoga Nidra - visual imagery. The figure shows general brain areas active during the visual imagery portion of the meditation: occipital cortex (minus the V1 cortex); primary visual cortex; parietal cortex. Source: Brain image adapted (photoshop to highlight brain areas) from The University of Washington Digital Anatomist Image Collection Manager website: http://imagemanager.biostr.washington.edu accessed 6/15/06.

Interestingly, during the visual imagery in Yoga Nidra meditation, prefrontal and cingulate activity was not found, even though these two areas were found to be active in the visualization of Tibetan Buddhist meditation and the mantra practice of Kundalini Yoga

meditation. This discrepancy in the activation of higher cognitive centers could potentially be explained by differences between the specific meditation techniques: these two brain areas are highly involved in emotional processing, and the Yoga Nidra imagery removes imagery with emotional context. Because *ishvara pranidhana* is a devotional state in which one channels emotional experiences to the visualized and contemplated image is *ishvara* (and the self merged with *ishvara*), *ishvara pranidhana* differs from Yoga Nidra in this regard. *Ishvara pranidhana* shifts emotional processing; therefore, we might likely see neurophysiological activity more like that during the Tibtetan Buddhist meditation – that is, in the PFC and ACC – than during Yoga Nidra.

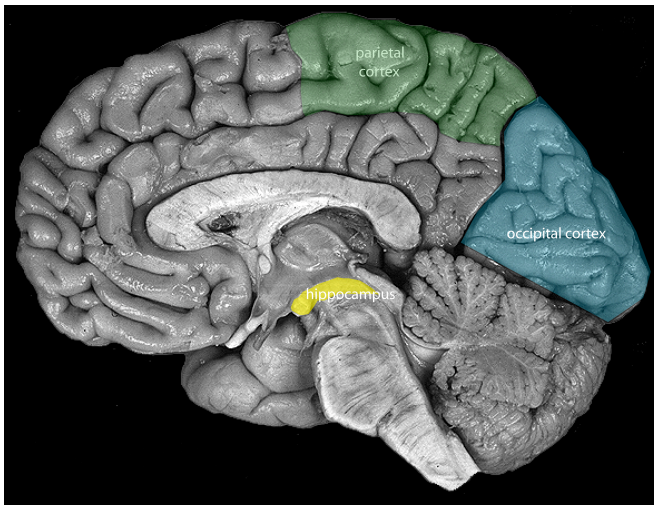

Figure 6: Yoga Nidra - abstract sensation of joy and happiness. This figure shows areas of the brain active during the meditation on abstract sensations of joy and happiness (except some left-sided activation not visible from this angle). Source: Brain image adapted (photoshop to highlight brain areas) from The University of Washington Digital Anatomist Image Collection Manager website: http://imagemanager.biostr.washington.edu accessed 6/15/06.

Other stages of Yoga Nidra meditation revealed some different areas of activation. Lou et al. reported that during the meditation on abstract sensations of joy and happiness, activation is almost exclusively limited to the left hemisphere, specifically the left hemisphere parietal and superior temporal lobes, left hippocampus (indicated in most states in this study), and left occipital activation as shown in Figure 6 (left side temporal lobe not highlighted in the figure). Since experiences of joy and happiness can occur during "peak" experiences of *ishvara*

pranidhana (Corby et al., 1978), these areas could also be expected to be active during *ishvara pranidhana* as well. As noted in Table 1, Lou et al. (1999) also reported bilateral parietal activity when the subject meditated on a symbolic representation of self (no figure). In *ishvara pranidhana*, both visual imagery and mantra are symbolic representations of self; therefore, parietal activity could also occur during *ishvara pranidhana*. Taken together, these findings suggest further evidence that even a single meditation practice does not have a uniform neurocircuit active throughout every stage or moment of practice.

Contemplation and Cultivation of States of Being: Function and Structure

Lutz, Brefczynski-Lewis, Johnstone, and Davidson (2008) used fMRI to study functional brain activity in a self-generated state of compassion during a Buddhist meditation alternating with a resting state in 8 experienced practitioners (with between 10,000 – 50,000 hours over 15-40 years of practice). These were compared with 8 age-matched healthy control volunteers who were interested in learning to meditate. During this meditation, the practitioner is not focused on any particular object but rather exercises an open-awareness in which attention is directed to moment-to-monent awareness on the ongoing activity of the mind. Lutz et al. (2008) reported common activation in the striatum, anterior insula, somato-sensory cortex, anterior cingulate cortex, and left-prefrontal cortex and a deactivation in the right interior parietal, thus, similar regions of activation as the studies just presented. In addition, activation of this pattern was enhanced in adepts as compared to novices.

Lazar and colleagues (2005) had previously conducted an MRI study of the brain structure of Insight meditation practitioners, a meditation practice to the Buddhist meditation discussed above (Lutz et al., 2008), that compared MRI measurements of the thickness of the cortex of meditators with the thickness of the cortex of non-meditators. Lazar et al. (2005) showed that the prefrontal cortex and right anterior insula were thicker in subjects with extensive meditation experience than matched controls. The twenty subjects had on average between 7-9 years of practice experience, with participation in at least one week-long Insight meditation retreat, which entails 10 hours of practice per day. Fifteen control participants with no meditation experience were matched on a number of variables. The meditation practice in this study is similar to *ishvara pranidhana* in that to evoke contemplation during meditation both require focused attention to internal experiences. Attentional focus is thought to be mediated, at least in part, by activity in the prefrontal cortex. Thus, it is possible that *ishvara pranidhana* might also be associated with increases in cortical thickness in this region over the course of long-term practice. More generally, since the idea of experience-dependent plasticity - i.e., that any experience can modify the structure of the brain - has become well accepted, this report of changes in cortical thickness during meditation is not surprising. What is important about studies measuring changes in brain structure related to specific experiences is that changes in specific brain areas can be consciously induced through careful selection of behavioral or mental tasks. In this case, consciously performing meditation leads to changes in the prefrontal cortex, a main area involved in executive functions. What remains to be examined is whether the prefrontal cortex is bigger to begin with in those

choosing to become serious long-term meditators; correlation does not suggest any directionality regarding causality.

Cellular Level Activity during Meditation

To date, only one study has been conducted measuring neurotransmitter conductance in the nervous system during meditation. Kjaer et al. (2002) did a PET study of the relaxed yoga meditation state induced through the tantric yoga practice of Yoga Nidra (also discussed above as the meditation technique in Lou et al., 1999) in order to access possible synaptic mechanisms for the regulation of conscious states. Kjaer's study is significant since it identifies a neurotransmitter that correlates with the meditation task. They examined scans of eight highly experienced practitioners during the relaxation meditation and during rest. Meditators had practiced meditation on a daily basis for 7-26 years. Kjaer et al. (p. 259) reported definite correlations between the meditative task and neurotransmitter release, showing, "increased dopamine release in the ventral striatum … during relaxation meditation, as evidenced by reduced 11C-raclopride binding, seems to be associated with the observed reduction in readiness for action during meditation." This decrease in binding is thought to correspond to an increase in endogenous (produced in the brain) dopamine release. To explain this finding, Kjaer et al. suggested that Yoga Nidra causes a suppression of the cortical activation of striatum relative to fMRI findings of striatal decreased activity, which could in turn increase activity of dopamine input to the striatum. However, whether a specific aspect of Yoga Nidra is associated with this change is not clear.

Finally, although there are similarities between Yoga Nidra and *ishvara pranidhana*, some significant differences in types of mental imagery and in attentional deployment makes it difficult to predict whether these specific changes found in Yoga Nidra would occur during *ishvara pranidhana* as well. The increases in dopamine release in this study were also associated with loss of executive function during meditation, defined in terms of attention (or readiness) to action. Because *ishvara pranidhana* and other meditation practices at least seem to maintain use of executive function throughout most of the stages (although at some advanced stage this function might be lost, too), this point needs to be carefully analyzed further with respect to specifics of different meditation practices. A major benefit of this study is that Kjaer provides some evidence regarding effects of meditation at the synaptic level.

Summary of Neuroimaging Studies of Tantric Absorptive Meditation Similar to *Ishvara Pranidhana*

Although as of yet there are only a small handful of neuroimaging studies on different meditation techniques, there are still several common findings evident among the studies. First, almost all of the studies reported at least some area of the frontal lobe active during different aspects of these meditation techniques, and the prefrontal cortex (PFC) in particular. Specifically, visualization activated PFC regions including the DLPFC, I/OFC, and DMC (Newberg et al., 2001); mantra activated the PFC (Lazar et al., 2000); and deep relaxation activated the frontal lobes generally (Lou et al., 1999). Contemplation also activated the PFC and this activity, as measured in long-term practitioners, was found to be associated with increased cortical thickness in that area

(Lazar et al. 2005). Second, there are several subcortical areas that were activated in at least two of the studies. For example, both visualization and mantra activated the midbrain (Newberg et al., 2001; Lazar et al., 2000), which is an area that produces dopamine, while both mantra and deep relaxation activated the hippocampal areas involved in memory and the parietal areas involved in sense of self in space (Lazar et al., 2000; Lou et al., 1999). Mantra and deep relaxation also both activated areas of the striatum - the putamen /caudate sub-areas of the striatum (mantra) and the ventral striatum (deep relaxation). Table 2 summarizes the functions of different brain regions that have been shown to be active in meditation, indicating whether the region is active during the default mode of non-task orientation and during what specific aspect of meditation the region is active.

Table 2: Shifting brain activity during different mental states

Brain region	General function when active		default mode	Meditation task oriented state
CORTICAL REGIONS:				
Frontal cortex, including prefrontal cortex (PFC), dorsal lateral prefrontal cortex (DLPFC), medial prefrontal cortex (MPFC), and Inferior and orbital frontal cortex (I/OFC)	PFC: attentional control system of working memory – retrieving and encoding memories - and other executive functions. DLPFC: "executive" cognitive functions (Kandel et al., 2000). MPFC: integrate (evaluate) emotional and cognitive processes by incorporating emotional biasing signals or markers into decision-making and emotional processing. I/OFC are thought to be responsible for the perception and discrimination of odors, connections with amygdala and hypothalamus thought to mediate emotional and motivational aspects of the behavioral (Kandel et al., 2000).		Medial prefrontal cortex: active	* PFC strongly active (mantra) *PFC active early to late stage (mantra) *superior frontal lobes: active (body sensations – YN) *dorsomedial cortex: active (visualization) *DLPFC: active (visualization) *I/OFC: active (visualization)
cingulate cortex	General monitoring functions;		Posterior	*cingulate gyru: active (visualization)

Table 2: continued

	evaluates salience of information. Posterior cingulate cortex and adjacent precuneus areas continuously gather information about the worlds around us and possibly within us (Raichle, 2000).		cingulate cortex and adjacent precuneus : tonically active	*pregenual ACC: active from control to meditation (mantra) *pre and post central gyri: active early to late stage (mantra)
Parietal cortex, including posterior superior lobule (PSPL)	PSPL has a role in generating a sense of the body in space (R-PSPL) and a boundary between self and other (L-PSPL).		Appears to be involved in default system	* parietal cortex strongly active early to late stage (mantra) * parietal lobe active (body sensations – YN) *parietal lobe active (sensation of joy and happiness - YN) * parietal lobe active (visual imagery - YN) *bilateral parietal activity (representation of self - YN) *parietal sensory and associated regions barring V1 active (body sensations; sensation of joy and happiness , visual imagery, representation of self - YN)
Temporal cortex	Temporal lobe is involved in hearing and high level auditory processing, speech, comprehension, verbal memory, naming (category knowledge) and other language functions, visual processing (for example, faces and scenes), and episodic/declarative memory.			*active early to late stage (mantra) *superior temporal active (sensation of joy and happiness - YN) *temporal
Occipital lobe	The occipital lobe is the main visual processing center of the brain.			*Strong activation sparing V1 (visual imagery – YN) *occipital sensory and associated regions barring V1 active (body sensations; sensation of joy and happiness , visual imagery, representation of self - YN)
Sensorimotor Cortex	The sensorimotor cortex is the primary cortical processing center for sensory and motor signals.			*active (visualization)
SUBCORTICAL REGIONS:				
Midbrain	Midbrain controls many sensory and motor functions, including eye movement and coordination of visual and auditory reflexes. It contains the substantia nigra (voluntary movements) which produces dopamine and plays a role in motivation and habituation, and also contains the ventral tegmentum area (Kandel et al,		The midbrain is highly intercon-nected with MPFC, which is active in default	*active (visualization) *active control to meditation (mantra)

Table 2: continued

	2000).		mode.	
Caudate	The caudate is a major structure of the basal ganglia, and an important part of the brain's memory and learning system especially during feedback processing; it also provides inhibitory input to the substantia nigra (midbrain) in eye movements. Together with the putamen forms the dorsal striatum.		--- (not mentioned in literature on default mode)	*active control to meditation (mantra)
Putamen	The putamen is a part of the basal ganglia and is an important site for integration of movement related and sensory feedback information related to movement; and plays a role in reinforcement learning. Together with the caudate forms the dorsal striatum.		--- (not mentioned in literature on default mode)	*active control to meditation (mantra)
Striatum (consisting of caudate, putamen, and ventral striatum (which includes the nucleus accumbens)	The striatum is required for operant conditioning; assessing saliency of stimuli, especially reward stimuli; planning and modulating of movement pathways and other cognitive processes involving executive function.		The ventral striatum is highly intercon-nected with MPFC, which is active in default mode.	*ventral striatum: decreases in binding in dopamine receptors (YN)
Septum				*active control to meditation (mantra) *active early to late stage (mantra)
Amygdala	The amygdala is located deep within the temporal lobe and is part of the limbic system. The amygdala mediates autonomic expression and cognitive experience of learned emotional states, particularly fear and anxiety, and mediates both unconscious emotional states and conscious feeling. It also plays a role in arousal and conscious perception of emotion, and the formation and storage of memories associated with emotional events.		The amygdala is highly intercon-nected with MPFC, which is active in default mode.	*active control to meditation (mantra) *active early to late stage (mantra)
Hippocampus	The hippocampus is located in the medial temporal lobe, forms part of the limbic system, and plays a part in long-term memory formation and spatial navigation.		--- (not mentioned in literature on default	*active control to meditation (mantra) *active early to late stage (mantra) *bilateral hippocampus active (body sensations; sensation of joy and happiness, visual imagery,

Table 2: continued

	It forms explicit memories (people, places, and objects), and has an indirect role in emotions.		mode)	representation of self - YN)
Hypothalamus	The hypothalamus links the nervous system to the endocrine system via the pituitary gland, and through this link, the hypothalamus coordinates the peripheral (physiologic) expression of emotional states through autonomic and somatic responses.		The hypotha-lamus is highly intercon-nected with MPFC, which is active in default mode.	*active control to meditation (mantra) *active early to late stage (mantra)
Thalamus	The thalamus is a processing and relay station for sensory information to the cortex. It has an important role in regulating sleep and wakefulness, regulating arousal and level of awareness and activity, and in circuits involved in consciousness.		--- (not mentioned in literature on default mode)	*active (visualization)

Applying Neuroimaging Studies to *Ishvara Pranidhana*

Anandamurti's method of *ishvara pranidhana* centers on several aspects of the techniques discussed above: mantra, visualization, and contemplation; therefore, it seems reasonable to think that cortical and subcortical brain areas found to be active during the neuroimaging studies of these techniques could also be active during *ishvara pranidhana.*

Taken together, these studies reflect a general pattern suggesting activation of attention networks with possible modulation from memory and emotion networks. Almost every study reported frontal cortical activation of some sort, especially in the PFC and ACC. These two areas are important for shifting and sustaining attention. The parietal cortex was also often activated during these different forms of meditation, including visualization and mantra meditations. Interestingly the right parietal cortex showed deactivation in fMRI during the Buddhist compassion meditation. This could indicate decreased attentional processing during the advanced state of practice in which

the meditator has self-generated a particular state of compassion rather than focusing on any one thing. That the hippocampus was activated during some meditations on visual imagery, including symbolic representation of the self, and during mantra meditation, but not active during other forms of meditation suggests that memory functions may vary with meditation technique. Brain areas important to emotion regulation and reward circuits, such as the midbrain and striatum are also implicated in some of the studies, with dopamine suggested as a potential neurotransmitter involved in certain meditation circuits and possible in *ishvara pranidhana*. See also reviews by Lutz et al. (2007) and Cahn and Polich (2006) for discussion of the psychological functions of these brain regions and their potential roles in meditative states.

A number of these brain areas are also connected to the autonomic nervous system, and could therefore participate in its regulation in terms of either activation or deactivation. Thus, changes in brain activity during meditation may generate shifts in autonomic nervous system (ANS) relaxation or arousal ("ecstatic") effects that have been differently reported. This model of frontal activation, with downstream effects in lower brain areas and the body (e.g., body chemistry and physiological functioning) potentially clarifies biological characteristics of meditation states, because the frontal area is believed to be important to conscious control and higher cognitive function. This higher cognitive control of ANS activation differs from the early model of ANS activation in meditation, which held that changes in the ANS drove "peak" experiences in meditation, i.e., absorption (Benson, Beary, and Carol, 1974). These newer data on higher brain areas active during absorption suggest a revised model, which includes higher cortical areas. In addition, any explanation of these changes must also contend with the idea that, in

addition to higher areas regulating lower areas, but that lower areas also modulate higher areas, too. This reciprocal causality must be accounted for in theories of meditation, since the reciprocal influences of the ANS and central nervous system on each other are now well accepted.

EEG: Evidence for Oscillatory Neural Synchrony in a Neurocircuit of Absorptive Meditation

By means of tiny electrodes placed on various locations on an individual's scalp, an electroencephalogram (EEG) measures the electrical signals (voltage differences) from large numbers of neurons across different brain areas (Cacioppo, 2007). The electrical activity is characterized as waves that reflect the rhythmicity and synchrony of neuronal firing, which is described in terms of frequency per second. Faster waves are called gamma, with the range moving to slower waves reflecting lower frequencies: gamma (fastest) involved in conscious attention, beta associated with alertness and activity, alpha associated with both awake and relaxed states as well as falling asleep, theta involved in both motor behavior and REM sleep, and delta (slowest) associated with deep sleep. EEG is capable of detecting changes in electrical activity in the brain on a millisecond level, and it is one of the few techniques available that has such high temporal (time) resolution.

A long line of research on meditation starting from the first-known EEG recording of meditation in the mid-twentieth century has shown a predominance of alpha and theta activity in the EEG during yogic meditation, along with evidence of

hypometabolic relaxation (Das and Gupta, 1958; Wenger and Bagchi, 1961; Anand et al., 1961; Elson, Hauri, and Cunis, 1977; Corby, Roth, Zarcone, and Kopell, 1978; Arambula et al., 2001; Aftanas and Golocheikine, 2001, 2002, 2005). This research, including two studies of *ishvara pranidhana* (Elson, Hauri, and Cunis, 1977; Corby, Roth, Zarcone, and Kopell, 1978), supports the view that meditation leads to a state of relaxation. Much of the methodological variation in these studies reflects efforts to clarify the specific role of meditation to this state and whether meditation itself is distinguishable from relaxation alone, with some evidence challenging and refining this relaxation view.

For example, Elson et al. (1977) matched *ishvara pranidhana* meditators (referred to as Ananda Marga meditators in this study) with non-meditating controls to investigate whether relaxing non-meditators achieve similar effects on the physiological state as those attained during meditation. Controls had no experience with meditation. Meditators were not assessed for proficiency, but researchers noted that 10/11 meditators had on average 18.8 months experience practicing meditation at least twice per day. The eleventh meditator was a teacher with advanced training and 54 months of meditative experience. Controls were instructed to remain "wakefully relaxed," that is, sitting comfortably in a chair without doing anything or falling asleep and remaining relaxed, while meditators meditated sitting on the floor for the same amount of time. EEG recordings were taken during the meditation task for the meditators and the wakefully relaxed state for the non-meditators, and during an eyes-open non-meditation period following the test session for both groups. The results indicated that while non-meditators tended to fall asleep during the task, all the meditators were able to remain in alpha-theta activity during the meditation session, a state defined as physiologically different from

both relaxed wakefulness and sleep. Also, the amount of time spent in theta was longest for the meditation teacher and this subject was the only one who maintained some theta during the eyes-open period following meditation. This study concluded that *ishvara pranidhana* meditation resulted in a physiologically different state from both relaxed wakefulness and sleep.

In another example, Corby et al. 1978 studied the state of *ishvara pranidhana* meditation in proficient (an average of 2.1 years experience in meditation with 3.1 hours a day) and expert meditators (an average of 4.4 years experience in meditation and 3.4 hours a day). This study conceptualized the meditation as the ability to concentrate attention and direct its focus either outward or inward. A third control group had no experience with meditation or any attention training, and were instructed to perform meditation techniques similar to techniques used by the experienced meditators. All subjects were asked to rate the quality of their subjective experience during their session, and all groups similarly reported no difficulty staying awake, increased euphoria, and a continued state of relaxation as they shifted from normal consciousness into meditation. Results indicate that 17/20 meditators increased EEG alpha and theta power during meditation, with the more proficient meditators having higher theta. Meditation decreased time in sleep, with meditators spending less time in sleep than controls. In all, this study reports that the findings that meditators became physiologically activated while controls became relaxed discounts the view of meditation as only inducing deep relaxation. This study attributes differences between groups that emerged during meditation to the prolonged effects of practice rather than the technique itself. See Cahn and Polich (2006) for further discussion of studies of other types of meditation techniques showing that

meditation produces increases in alpha beyond that obtained from reducing general arousal.

While alpha rhythms are thought to characterize a relaxed, "unoccupied brain" or psychological state (Klimesch, 1999), that meditation shows alpha greatly combined with theta deserves some discussion, especially since a number of previous studies have reported that proficiency in meditation shows more theta power (Elson et al. 1977; Corby, 1978). The alpha and theta rhythms of TM (Transcendental Meditation) correlate with brain activation spreading into the frontal channels (Wallace, 1970), with global frontal-central increases in alpha (e.g., Delmonte, 1984). Some more recent studies have demonstrated that more proficient meditators have increased theta in the frontal midline area (the region where the hemispheres meet), as well as in the general midline area (i.e., Yoga Nidra meditation) (Lutz, 2007; Cahn and Polich, 2006). However, the theta at midline has also been associated with sustained attention. There is also consideration that drowsiness or some sleep-like conscious awareness might be the source of theta, but results are mixed (see Cahn and Polich, 2006). In a careful consideration of what EEG reveals about sleep states, Elson et al. interpreted alpha-theta as a transitional phase between waking and sleep. Thus theta waves are not like, though not necessarily unlike, simple relaxation. Yet whether meditation produces these effects or people who have a natural proclivity to be in these states are drawn to meditation remains unresolved.

Moreover, neural activation recorded through EEG studies needs to be understood in relation to other findings of changes in autonomic activity and relaxation. While a number of studies have shown that lowered autonomic arousal characterizes the EEG pattern of yogic concentration practices including TM (e.g., Fenwick et al., 1977; Shapiro

and Walsh, 1984; Delmonte, 1985), two early studies recorded the opposite finding of increased autonomic arousal in advanced yogic practitioners (Das and Gastaut, 1955; Wenger and Bagchi, 1961). Similarly, Corby et al.'s (1978) controlled study of *ishvara pranidhana* revealed that more experienced advanced practitioners exhibited increased autonomic activation during meditation while less experienced meditators demonstrated autonomic relaxation (see also review by Lutz et al., 2007). These findings raise questions about whether meditation induces simply relaxed states or some other state of consciousness. There is also some physiological evidence that the goal state of yogic absorption or *samadhi* differs functionally from a relaxed non-meditative state. Findings of increased autonomic activity during absorption have been reported (Wenger and Bagchi, 1961; Elson et al, 1977; Corby et al., 1978; Das and Gastaut, 1955), although this is a rare state and there are mixed findings as to whether there is concomitant EEG activation in yogic *samadhi* (Das and Gestaut, 1955). Neither Wenger and Bagchi nor Corby found any EEG activation in this goal state. We will discuss this issue of autonomic activation more in a later section that explores downstream effects of meditation through different brain-body dynamics.

The EEG measurement of alpha blocking has been proposed as a possible measure of deautomatization, in which subjects refrain from the normal habituation to stimulus recurring in the environment. EEG alpha blocking is thought to measure an individual's ability to deautomatize. Alpha blocking refers to the loss of alpha waves as a scale of increased synchronized neural activity during the period of deautomatization. In one study, alpha blocking was exhibited in normal persons practicing the simple yogic meditation technique of Transcendental Meditation (TM) (Wallace, 1970). In another

study, long-term meditators were found to exhibit greater alpha activity earlier in the session and with less habituation compared to controls during a stimulus response task (Williams and West, 1975). To the extent that these EEG patterns reflect mental states, meditators appear to be able to maintain constant conscious awareness of their environment while simultaneously maintaining a state of deep concentration. If so, this simultaneity represents remarkable attentional control and that manipulation of the mental process of attentional functioning is one way in which meditation practice achieves altered consciousness.

Two early EEG studies showed a difference in alpha blocking between two different types of meditation. Zen or Zazen meditation is a Buddhist practice of sitting meditation in which practitioners maintain an open-eyed, downcast gaze about a meter in front of their bodies, while yogic meditation, as discussed previously, is a closed-eyed meditation to turn attention inwards. Kasamatsu and Hirai (1966) found an alpha pattern similar to the pattern of EEG activity discovered in multiple other studies and showed consistent alpha blocking to auditory stimuli that did not habituate throughout Zen or Zazen meditation, while Wenger and Bagchi (1961) showed no alpha blocking in yoga meditation. The consistent activity during Zen led the researchers to conclude that, for advanced practitioners, there is almost no adaptation to alpha blocking during the Zen meditation, meaning that Zen meditators continue to perceive stimulus consistently throughout the meditation. These findings are consistent with subjective reports of meditative states of deep emersion in the present moment because of withdrawal from distractions (yogic) or mindfully present of ongoing moment-to-moment sensory experience.

It is actually quite profound that the Zen masters exhibited fairly constant alpha blocking throughout the test of response to stimulus. In normal wake state, subjects who do not practice meditation "habituate" to stimulus. This tendency means that when presented with a constant sound or light stimulus (as was the case in this study), subjects have an initial reaction to the stimulus and then eventually cease to respond to the stimulus. This cessation can be thought of in the sense that the stimulus somehow goes "off the radar" of what the nervous system will respond to, or no longer remains in conscious awareness.

Some issue might be taken with the claim of "constant conscious awareness" of the environment while in a state of absorption as to whether this sort of state reflects the true goal of tantric yoga, and whether alpha blocking or desensitization applies during *ishvara pranidhana*. As I claimed earlier, TM has some aspects of the meditative technique and goal state in common with *ishvara pranidhana*. Thus I think that this phenomenon of no alpha blocking may very well apply during *ishvara pranidhana* practice when meditators remain in a state of conscious awareness of the environment. But the end state of *ishvara pranidhana* is not the penultimate of traditional tantric yoga meditation (see chapter four), or of Anandamurti's system. The yogic technique of Wenger and Bagchi's study was not specified clearly enough in their report to be able to evaluate whether this technique is similar to *ishvara pranidhana*. It could be that this unspecified technique is closer to the more advanced meditation methods taught in Anandamurti's system, and therefore that more advanced technique would also lead to a state in which no alpha blocking occurs. Such a state could be one in which one loses conscious awareness of the environment while entering into deeper states of absorption.

Advanced EEG studies assess EEG coherency and high frequency gamma band in attempts to characterize mechanisms of conscious awareness and perceptual binding (Cahn and Polich, 2006). For example, in a recent study Lutz et al. (2004) reported high-amplitude gamma oscillations in the EEGs of long-time practitioners that were not present in the initial baseline, and the amplitude of the gamma oscillations increased over time of the practice. They characterized the ratio of gamma to slower waves, finding that the ratio was initially higher at baseline for practitioners than controls. Also, baseline differences increased sharply during meditation in comparisons between gamma activity and both theta and alpha activity for practitioners. They found a higher ratio of fast versus slow oscillations for long-term practitioners versus controls in the initial baseline over medial frontoparietal electrodes (relative gamma power), a finding that suggests that practitioners and controls had different electrophysiological spectral profiles in the baseline and that meditation could be associated with a trait.

The researchers further analyzed the on-going gamma activity itself to find a common topographical pattern of activity bilaterally over the parietal, temporal, and midfrontal electrodes (absolute gamma power) for practitioners but not controls. Thus, they concluded that, in general, the meditative state was associated with gamma oscillations that were significantly higher in amplitude for practitioners than for controls. Findings from a long-distance synchrony analysis between four regions within the bilateral area of the parietal, temporal, and midfrontal regions showed a greater size of the synchronous pattern for practitioners than controls, suggesting that large-scale brain coordination increases during mental practice. Finally, researchers obtained data

suggesting that the degree of training, i.e., number of hours spent in formal sitting meditation, can influence the spectral distribution of the ongoing baseline EEG.

In their review of neuroelectric correlates of meditative states, Lutz et al. (2007) argue that there is an important link between the activation pattern of brain states and the patterns of consciousness. Lutz explains oscillatory synchrony as a mechanism for coordinating communication between spatially distributed neurons, or neurons that are located in different areas of the brain, and points out a number of authors who have proposed that the mechanisms of synchrony could mediate various features of consciousness. They go one step further to explain that the emergence of a specific coherent assembly underlies the operation of any moment of experience. The transition from one moment to the next could be subserved by desynchronization of some coherent neural assemblies and the synchronization of new ones. In some way, then, every state reflects some degree of synchrony. What distinguishes functionality appears to be the particular regions and circuits activated and involved in the synchrony occurring in a particular moment. For example, alpha desynchronization reflects cognitive processes such as attention, memory, and emotion or active inhibition of non-task relevant cortical areas (Lutz, 2007 from Klimesch, 1999). If this view of synchrony as a mechanism of consciousness is correct, then the alpha or theta rhythms associated with the task during the last phase of *ishvara pranidhana* of turning one's awareness inward to focus on the source of consciousness and cultivating this experience as a state of being would be associated with the synchronization of attention networks and other structures that contribute to the sorts of mental activity that occurs during this meditation.

Lutz et al. (2004) attribute the difference in findings between their study and other

EEG studies that found slow wave activity to differences between the particular meditation techniques, explaining that most of these previous EEG meditation studies "investigated different forms of voluntary concentrative meditation on an object (such as a mantra or breath)." Lutz (2004) characterizes the concentration techniques as a "form of 'top-down' control that may exhibit an important slow oscillatory component (22)." In contrast, Lutz describes the objectless meditation at the center of the study as cultivating a state of being in which the "object-oriented aspect of experience appears to dissipate." In fact, this very "dissipation" of object-orientation is also at the essence of later phases of Anandamurti's method of *ishvara pranidhana*, even though *ishvara pranidhana* initially employs the use of mantra and concentration. Lutz reasons that this evidence of synchrony suggests that various meditative states may be associated with different EEG oscillatory signatures. Because of this similarity, long-term practitioners of Anandamurti's method of *ishvara pranidhana* meditation might also exhibit some similar sort of high amplitude gamma synchrony. Assuming this theory is correct, *ishvara pranidhana* might exhibit a range of oscillatory signatures throughout the course of the meditation as the practitioner progresses through the phases of the practice.

To summarize, yogic meditation generally leads to a special state of relaxed awareness distinguishable from both sleep and wakefulness that is characterized by alpha and theta waves that move towards frontal areas. Effects seem to carry over after meditation period officially ends, with no alpha blocking. These findings all support claims of yogic meditators remaining in a state undistracted by external stimuli. Greater proficiency in meditation produces more theta waves. Expertise defined in terms of attaining the goal of *samadhi* (absorption) is not well studied, but EEG may not be an

adequate measurement approach to this method. Innovations on typical EEG methodology that characterize gamma activity may lead to more understanding of the kind of awareness associated with meditation, illustrating, for example, how neural synchrony might be applied to meditation as a mechanism of conscious awareness and perceptual binding. However, it is not yet clear whether and how meditation practices produce increased alpha beyond that obtained from reducing general arousal; however, this understanding may become clear only when combined with other neuroimaging methods (Cahn and Polich, 2006). Finally, although meditation influences EEG measures, it is also not clear how meditation affects cognitive states and alters CNS traits.

Effects of Meditation on Brain-Body Relationships

While much of the current research on meditation is focused on the impact of meditation on the brain, earlier studies of meditation began the line of research by looking at the body and physiological responses to meditation (some earlier research also looked at the brain via EEG methods, as discussed above). I think that the evidence from studies on the physiological effects of meditation supports seeing three brain-body relationships that are affected by meditation. Here I discuss evidence of changes in the autonomic nervous system, the neuroendocrine systems, and even the peripheral nervous system. I see all this evidence together as further support for a "downstream effects" view. Earlier I discussed research that suggests that higher brain activity affects activity in lower brain areas, and suggested that activation in higher brain areas might have a downstream effect on lower brain areas, a relationship that can also be reciprocal. Here I

suggest that the evidence from studies of the effects of meditation on the body supports the notion that downstream effects of the brain extend into the body.

One of the most important insights from the early studies on meditation that continues to impact the field today was Benson's (1974) assertion that meditation causes a "relaxation response" during practice sessions, an effect that may continue after practice and become entrained as a trait over time. The relaxation response during meditation is characterized by decreased heart and respiration rates (Bagchi and Wenger, 1958; Wallace, 1970 and Wallace and Benson, 1972), decreased oxygen consumption and carbon dioxide elimination (Anand et al., 1961; Wallace, 1970; Wallace and Benson, 1972). Decreases in heart rate mean subsequent decreases in blood flow and blood pressure. These decreases are significant because they bring the role of the autonomic nervous system (ANS) in affecting change in the state of consciousness further into focus (Wallace and Benson, 1972): the ANS regulates changes in blood flow and pressure and changes in heart rate. The measurable changes in the cardiopulmonary system can be used either as an indicator of how meditation affects the brain and thus the ANS indirectly, or how meditation affects the ANS directly.

Demonstrating a second brain-body relationship, a number of studies of various techniques of meditation have reported changes in body chemistry that result from neuroendocrine changes, including regulation of the hypothalamic-pituitary axes. For example, Infante et al. (1998) reported that the hormones of the hypothalamic-pituitary axis are modified with regular practice of Transcendental Meditation (TM). Specifically, meditation has been reported to result in an increase in dehydroepiandrosterone sulfate (DHEAS) (Glaser et al., 1992), an anti-aging stress hormone produced in the adrenal

glands and elsewhere, and an increase in night-time plasma levels of melatonin (Tooley et al., 2000), a hormone produced in the pineal gland that is thought to be not only an anti-stress and antiaging hormone but also to have anti-cancer effects and positive effects for immune functioning (Tooley, 2000). The pineal secretion of melatonin has a central role in regulating the circadian rhythm, a body rhythm that causes changes in behavior and shifts in consciousness relating to sleep and wake states.

What is significant about the hypothalamic-pituitary chemical cascade through the bloodstream and nervous system is that these chemical cascades have specific associations with and implications for psychological phenomena and behavior. For example, people with anxiety may develop an excessive rise in blood lactate concentration with stress (Cohen and White, 1950; Wallace et al., 1971) and experimental results show decreased levels of lactate in the blood of meditating subjects (Wallace, et al., 1971; Wallace and Benson, 1972). A lower level of lactate in the blood of meditators correlates with decreases in anxiety and may be associated with the subjective feelings of relaxation (Wallace et al., 1971). While a cause for the fall of blood-lactate level is unknown (although some speculate the lower levels are due to relaxation of skeletal muscle tissue, which is the main site of lactate production (Wallace and Benson, 1972), it is known that a lower lactate level relates to a lower heart rate, one of the physiological measures of meditation practice. In addition, lower serum lipid peroxide levels are found in meditators (Schneider et al., 1998) and are thought to be associated with reduced stress. Note that lipid peroxides cause toxic effects and are considered a pathological process, and refer readers to the “purification” concept associated with meditation from the emic perspective. Another example of the association

between hypothalamic-pituitary chemical cascades and psychological phenomena is the chemical cascade of the hypothalamic-pituitary-adrenal stress hormones secretions (such as cortisol) into the bloodstream.

In addition to changes in the autonomic nervous system, at least one change during meditation has been measured in the peripheral nervous system. Meditation has been found to increase skin resistance (Wallace, 1970; Wallace, Benson and Wilson, 1971; Wallace and Benson, 1972; Bagchi and Wenger, 1958). Efferent pathways from higher cognitive centers, down the nervous system to motor centers and through to the motor neurons, connect to the skin in the body. These pathways affect the level of tension of muscles. Skin resistance (a measure of the electrical resistance of the skin) is thought by some to reflect the level of anxiety (Wallace and Benson, 1972) or some other type of emotional arousal. A decrease in skin resistance represents greater anxiety while an increase in resistance signifies greater relaxation. Thus, this physiological measure can also be taken as a correlate, indicator, or measure of the psychological effect meditation has on practitioners. That motor control and movement - and thus posture, behavior, and action - relate to psychological experience should be understood because the meditative posture undoubtedly plays a significant role in the body's ability to signal changes leading to meditative consciousness.

These findings are suggestive of changes in three brain-body relationships: the brain stem and autonomic nervous system, the spinal cord and the peripheral nervous system, and neuroendocrine interactions. Whether all these are effects on the body of maintaining a physical state or whether they involve the brain, or perhaps have a psychological dimension, remains to be clarified. The recognition that meditation induces

relaxed states of the body has gone far to both draw attention to meditation as a method to aid in clinical practice and to foster further research to clarify the nature of meditative relaxation, especially as it may relate to the mind. Questions on this latter issue revolve around clarifying whether meditation is a unique state of consciousness that differs from both wake and sleep states and examining whether meditation is better characterized as a state or as an enduring trait, or as both, as a number of researchers suggest (e.g., Cahn and Polich, 2006).

Based on these early findings, a number of scientists and scholars have theorized about the operations of the brain during meditative practice to address the seemingly contradictory reports that meditation leads to both a deep sense of calm but can also lead to yogic ecstasy, culminating in peak experiences (see chapter four for elaboration on tantric theories of yogic ecstasy). Fischer (1971) and others (e.g., Gellhorn and Kiely, 1972) have argued that autonomic arousal could be used to explain a range of experiences in meditation. They suggested that autonomic arousal during meditation occurs on a continuum from parasympathetic or hypoactivity (less activity) that induces feelings of relaxation and calmness to sympathetic or hyperactivity (more activity), which could explain the intensity of some mystical or "peak" experiences in meditation. Thus, this model can be useful for reconciling peak experiences with more commonly observed hypoarousal in meditative practice (Davidson, 1976). More recently, D'Aquili and Newberg (1992) proposed a detailed elaboration of this autonomic arousal model of the neurophysiology of meditative absorption, integrating earlier findings of frontal cortical activation associated with deeper states of meditation by positing that higher brain areas

involved in focusing attention during the meditation task such as the prefrontal cortex are necessary to understand variability of subjective experience.

Analyzing Neuroscience Perspectives on Meditation: Positioning Claims for Comparison with Yoga

This chapter has shown how neuroimaging and neuroelectric methods provide an avenue to examine ways in which the meditation task is organized in the brain. This chapter also argues that while specific mental processes involved in the meditation task cannot be correlated with brain activity, these methods can extend and expand on earlier research on meditation regarding body chemistry and physiological functioning by identifying specific brain areas that correlate with specific stages of the task. This discussion has focused on the shift from the normal mental process to absorptive meditation. This shift in mental states requires mental processes including attentional shift, sustained and selective attention, much concentration, and a balancing of cognitive and emotional processes; these processes are associated with activity in the prefrontal cortex. Because various regions of the brain that are activated during meditation are intricately connected to the rest of the body, activation of the higher brain areas are thought to lead to downstream effects in the limbic system, autonomic nervous system, peripheral nervous system, and endocrine system. Thus, activation of a functional circuit could possibly induce the experience of an altered sense of self variously felt as calm and peaceful, joyful and ecstatic, etc., at least in part, through downstream effects of upstream neural activation that reverberate throughout the body. In this case, both physiological

and biochemical changes in the body seem to support the overall functional state of meditation, but it is not clear how or if this activity includes a psychological dimension.

Despite this accumulation of some tentative and initial knowledge about the brain processes of meditation, Lutz et al. (2007) think that the evidence is not conclusive as to whether meditative consciousness is better characterized as a unique state or some well-defined mental wake state involving focused attention, contemplation, or some other cognitive qualities depending on the goals of the particular practice. The recent advances in methodology that allow scientists to image bodily organs including the brain have advanced knowledge about meditation somewhat in terms of identifying brain areas of interest, yet to date there still have been only a limited number of neuroimaging studies. There is still a sense that we do not know a great deal about the neurophysiological processes during meditation, and therefore cannot explain meditative consciousness, and this growing but still very sparse body of knowledge indicates a clear need for more research given the current climate of science driving funding and establishment of evidence-based treatment protocols. Perhaps this failure to establish this level of knowledge about meditation stems from a more fundamental problem: there is still no neuroscientific or brain-based theory of meditation.

Empirical knowledge about any natural phenomenon is derived from experiments that test theoretical propositions. This method of developing theory stands at the foundation of modern psychology. But as Gazzaniga and colleagues (1998) point out in their textbook on cognitive neuroscience, psychological theories are often derived from other methods. An important example is the set of current theories of attentional processes that originated from James and Helmholtz at the turn of the twentieth-century

and were derived largely from introspection. Therefore, it seems reasonable to use introspection to help develop psychological theories about meditative consciousness that could be translated into neurobiological terms for the purpose of hypothesis generation and experimentation.

Yet the question remains: even if we knew more empirically, would this knowledge satisfactorily explain the meditative consciousness of absorption? What *type* of theory about the mind can lay the groundwork for a brain-based theory of meditation?

Neuroscientists typically assume an identity between mind and brain; the most accepted idea is that these mental functions and mental states are neurobiological activity. Thus, mind is a property of brain activity. Put differently, Kandel et al. (2000) defined mind as "the entire set of operations of the brain." Thus a major challenge of cognitive neuroscience is to develop methods to test hypotheses that demonstrate relationships between mental functions and processes and the brain.

Moreover, the language of "the brain and the rest of the body" (i.e., neural versus non-neural tissue) implies some special status of the brain as different in some fundamental way from the rest of the body. This status generates from a popular neuroscientific understanding of brain as identical with mind (Churchland, 1988). Identity theories of mind characterize the neuroscience perspectives of mind-body relationships and interactions of the human being, and seem to give the foundation for the neuroscience premise of a mind-brain identity. But this premise is an assumption that presumes knowledge about the functional organization of the mind, i.e., that the mind is modular like we assume the brain to be (Logothetis, 2008). But what really is the functional organization of the mind?

In his discussion of the limitations of fMRI neuroimaging technology, Logothetis (2008) acknowledges potential ontological and epistemological issues with these assumptions necessitated by neuroimaging methods, pointing especially to the widespread assumption in neuroscience that the mind can be subdivided into modules or parts, whose activity can then be studied with fMRI. Yet he further acknowledges that the long history of philosophy of mind has proved that a theory of a unified mind with component parts is difficult to explain. This difficulty from a materialist perspective is perhaps the primary reason that theories of consciousness have largely been taken on in philosophy but mostly left alone by empirical science. Can function truly be localized in the brain? Neuroscience assumes that most mental functions can, but perhaps the most prominent exception – or at least challenge - is explaining consciousness. At the very least, neuroscience frequently assumes a functional modularity of the mind.

Theories attempt to explain the world, and so far this functional modularity type of explanation is the working hypothesis, the one that makes sense based on what we know about the brain. Although there is some limited work in neuroscience to explore possible mechanisms that explain a global unifying principle of mind, such as oscillatory neural synchrony as a mechanism of consciousness, the field of neuroscience takes the modular organization of many brain systems as a well-established fact: even modular organization can be consistent with neural synchrony as the foundation of consciousness. Thus, neuroscience findings support localization of function, at least if by "localization" one includes neural networks that extend across anatomical brain regions. The wealth of evidence in support of this from studying tractable functions (sensory systems, learning, etc.) creates a tendency to generalize to less defined functions (consciousness, etc.).

As indicated in chapter one, and as we will see further in the following chapters, in contrast to science, emic systems abound with theories of meditative consciousness. The problem with these theories, though, as with other psychological models and theories, is that they often lack empirical support to establish whether they explain the phenomena of interest. The case in point here is the tantric yoga theory that assumes a unified theory of mind-body, through the principle of oscillating consciousness. Yet there is neither evidence nor, perhaps more importantly, any reasonable translation of the theory into scientific terminology. It seems that such work that collaborates between emic theories and science is needed to advance understandings of meditation.

A complementary approach to studying meditation - one in which incorporating the emic perspectives becomes a valued approach to elucidate descriptive data - can help carve out hypotheses that can then drive further research. Drawing from the latest advances in understanding neurophysiological processes and combining these with tools of theoretical and philosophical psychology seems to provide a strategy to address questions about the highest levels of abstract mental functioning.

Chapter Four

Meditative Consciousness and the Yogic Body of Tantra

In the Introduction to his book, *Theory and Practice of Yoga*, Jacobsen (2005) proposes that different ideas of yoga, its practice, and goals are competing in scholarship. Eliade (1958) in his seminal work on yoga, *Yoga, Im mortality, and Freedom,* demonstrates chapter by chapter various ways that yoga is practiced and theorized in a number of Indian religious traditions throughout various historical eras and social contexts. My exposition will follow this precept, considering select yoga traditions with the explicit purpose of understanding the mental processes of *ishvara pranidhana* meditation within the context of tantric yoga.

In chapter three, I examined the neurophysiological correlates of meditative tasks, attention, memory, and emotion. In this chapter, I turn to an examination of these three mental processes from the tantric yoga perspective. In this chapter, I explicate *ishvara pranidhana* in strictly emic terms within traditional understandings of tantric yoga. I do this by analyzing key mental processes within classical ideas of yoga that seem to best correlate with the cognitive science concepts of attention, memory, and emotion. The processes of meditation from the emic perspective of yoga are *ekagrata* (concentrated mind), *samskara* (memory trace), and *samadhi* (absorption). Significantly, tantric yoga does not necessarily characterize these as "mental" processes. Instead, these terms are more like categories that describe experiential phenomena. There is a special focus on explicating how yoga sees these meditation processes in relation to the body. I argue that

we should interpret the yogic body as depicting an experiential reality that functions as an embodiment of consciousness.

Throughout this analysis, it should be understood that these three mental processes are synergistic. Just as attention, memory, and emotion may all seem to be static, serial, sequential and distinct processes because we draw these distinctions among them, the processes of meditation are likewise confluent. A practitioner moves among these three processes during any meditation session, and each of the first two processes of *ekagrata* and *samskara* (concentrated mind and memory trace, respectively) catalyze deeper states of absorption (*samadhi*).

Methodological Considerations

As mentioned in earlier chapters, *ishvara pranidhana* as currently practiced today is claimed to be explicitly based on tantric yoga principles, thus its choice as the focus of this dissertation: tantra provides the most elaborated ideas concerning the yogic body on which tantric meditation practices are based. The meditation method of *ishvara pranidhana* and its theories thus can be seen to constitute the emic perspective that I compare with the etic neuroscience perspective in part three.

There are two steps needed to explain this emic perspective on the tantric body. First, I explicate traditional tantric yoga in this chapter with an emphasis on experiential or phenomenological interpretation of the yogic body as a model of reality. However, Anandamurti's claim that his meditation technique is tantric yoga must be separately evaluated and put into perspective within the context of modernity and the modern phenomenon of yoga because his method of *ishvara pranidhana* is a twentieth to twenty-

first century practice. This second step is undertaken in the next chapter. Thus, part two sets the stage for the comparison of the two perspectives in the chapters of part three. That comparison requires an explication of the emic perspective on Anandamurti's method of *ishvara pranidhana*, and for this I needed to choose primary and secondary sources that would help me analyze and contextualize this meditation as a modern day tantric yoga meditation.

Given that extant literature pertaining to yoga spans at least 2500 years, I needed to identify material that would best describe traditional tantric yoga understandings of absorptive meditation as a reference for allowing me to analyze modern interpretations of the tantric yoga *ishvara pranidhana* meditation. I consulted with Asian Studies experts in the areas of Sanskrit and Indian religious literature about what sources to read and how to choose fundamental and comparison criteria. As I began reading primary material, I surveyed Indian literature for texts known to deal specifically with yoga and searched these texts for relevant data to yield a perspective on traditional and classical understandings of yoga, including tantric yoga.

I narrowed my selection to yoga material that emphasized mental or cognitive processes which could help me locate yoga practice and theory in the body. The main criterion for the selection of the evidence presented in this chapter was whether the data or information from the texts could potentially relate either obviously to the body, or perhaps less clearly relate to the body, but nevertheless to psychological processes studied in cognitive and related neuroscience fields pertaining to meditative transformation. In other words, when examining the sources I searched for evidence within these texts that suggested me ways of localizing yoga philosophy and practice in

the body and/or in psychological processes having possible neurobiological substrates. For example, since evidence from neuroimaging studies of the brain during meditation suggest that brain areas underlying attention, memory, and emotion play a significant role in meditation, I looked for evidence of yogic processes and experiences relating to these functions. I also analyzed how the yoga literature uses the terms "yoga," "meditation," and "tantra." In addition to primary source material, I gathered scholarship on traditional and modern perspectives on tantric yoga that met my selection and analytical criteria. The overarching focus remained on theories of mind and body that elucidate mental processes of tantric yoga meditation.

This chapter focuses on what the tantric philosophy of nondualism means in terms of understanding the mind, body, and meditation, thus on the cognitive processes involved in the shift from a normal waking state of awareness to meditative consciousness. Specifically, this chapter draws from traditional yogic psychological theories that localize *ishvara pranidhana* in the body, and thus elaborates on the theme of embodiment. Because this practice of *ishvara pranidhana* is claimed to be a tantric yoga practice, discussions of psychological transformations most prominently draw from Classical Yoga and Tantra to shape the practice and theory of meditation. For example, Anandamurti's modern concept employs the yogic concepts of *cittavrtti* (mental fluctuation or propensity), *samskara* (reactive momenta or subliminal impression), *klesha* (force of corruption), and *gunas* (binding forces) from Classical Yoga, and tantric concepts of the yogic body including *kundalini* (dormant spiritual energy), *chakra* (energy centers), *tattva*s (elements), and *nadis* (energy channels). As these elements derive from Patanjali's classical *Yoga Sutra* and medieval tantric yoga texts, I have

selected the latter as my primary Classical Yoga text; I will also draw selectively from scholarship on a small number of tantric texts that are particularly useful for further clarification.

Because "the rudiments" (Eliade, 1958, p. 102) of many of these Classical Yoga and tantric concepts derive from Vedic and especially Upanishadic (including Vedantic) traditions, my exposition on Classical Yoga includes an examination of a number of *Upanishads* (in particular, *the Principal Upanishads* and the *Yoga Upanishads)* and the *Bhagavad Gita*, including the *Svetasvatara*, *Katha, Maitri*, and *Taittiriya Upanishads* (*Principal Upanishads*) because they directly treat yoga. Most of the scholarship presented on Classical Yoga pertains to the *Yoga Sutra* and Samkhya philosophy insofar as Samkhya forms the philosophical basis for yoga. While the Gita is perhaps the most famous and well known text about yoga, it is not of much concern to my discussion as meditation does not form the emphasis of the Gita.

My examination then moved to tantric yoga perspectives. For this aspect of the process, I drew from contemporary secondary scholarship and not primary sources, except as quoted in the secondary works. Effectively then my discussion indirectly draws from a number of medieval tantric texts: the *Patnatika* (around 900 A.D., a Pasupata text); *Pasupata-sutra* (a Pasupata Saivite text); *Pancarthabhasya* (written by Kaundinya around the same time as a commentary to the *Pasupata-sutra*); Abhinavagupta's *Tantraloka* (TA) and *Tantrasara* (both tenth-century Kashmir Saivite texts); the *Malinivijayottara* (MVT) (the source of the TA and also a Kashmir Saivite text); Ksemaraja's *Sivasutravimarsini* (SSuV) (an early eleventh-century Kashmiri Saivite text on the science of mantras); *Yoginihrdaya* (YH) (Kashmiri Tantric tradition); *Bhutasuddhi*

Tantra (a Nath Siddha text); and the Hatha yoga*pradipika* (a fifteenth-century text written by Svatmaraman).

The classical models of tantric yoga also appear in contemporary scholarship on the phenomenon of modern yoga as translations of traditional interpretations of yoga from the late eighteenth century to the present. Subsequently, the complete English translations of discourses and writings by Anandamurti were also examined for evidence concerning meditation concepts and mental processes to explain *ishvara pranidhana*. I considered how these concepts relate to primary texts through direct references or conceptual links, and I also had numerous interviews and conversations with teachers initiated into Anandamurti's method of tantric yoga principally for the discussion in the next chapter, on the emic perspective on *ishvara pranidhana* as a modern day tantric yoga practice. In this chapter I focus on traditional understandings of the yogic body in tantra.

Ishvara Pranidhana in Patanjali's *Yoga Sutra* and Classical Yoga

A number of scholars highlight the prominence of *ishvara* in the *Yoga Sutra* (*YS*) (after this I will refer to the *Yoga Sutra* as YS) (e.g., Eliade, 1958; Oberhammer, 1989; Pfluger, 2005; Connolly, 2007). Several sutras in this text refer to the practice of *ishvara pranidhana* as a means to the transformational undertaking of the yogic praxis (Whicher, 1997). Pfleuger (2005, p. 32) provides support for investigating *ishvara pranidhana* in this regard, suggesting that "we may judge that attaining pure consciousness through ishvara is the means par excellence [of yoga], due to the unusual attention of [seven sutras to] this one meditative technique." This means that a person meditating (yogin)

who relates to *ishvara* (god) participates in a critical action or event (though there are also others) needing analysis for understanding absorption through meditation.

In *Yoga, Immortality, and Freedom,* Eliade (1958) writes that unlike Samkhya, the Classical Yoga of Patanjali accepts the existence of god. Pfleguer (2005) concurs that theism in the form of *ishvara* in the *YS* is the cornerstone of its worldview. Also recognizing the theism in the *YS*, Oberhammer (1989) describes the method of *ishvara pranidhana* as a theistic yoga practice. Eliade (1958, p. 75) tells us that Patanjali, by admitting *ishvara* (god) into his explication on yoga, acknowledges "a whole series of experiences that had been made possible by the single process of concentration on *ishvara*" that he could not neglect. Connolly (2007, p. 37) further explains that *ishvara* (god) provides the ideal focus for the attention of yogins because by contemplating *ishvara* (god) the meditating yogin "will gradually realize his own nature is just like that of *ishvara* [god]." This sort of single minded concentration in yoga is called *ekagrata* (Eliade, 1958). Thus key to yogic absorption is the mental process central to *ishvara pranidhana* meditation or the cultivation of *ekagrata* on *ishvara*.

The caveat, though, is that such a realization comes by the "grace" of *ishvara* (god). Thus Eliade (1958) identifies experiences of *ekagrata* as "mystical," and goes on to contrast this "mystical" tradition of yoga against the "magical" liberative path by which the practitioner attains the *samadhi* by will and personal power alone. The project at hand is to explicate the "mystical" process(es) found in *YS* that lead(s) to an experiential (as opposed to empirical) insight into the nature of reality and the nature of one's own self. In this spiritual context, *ishvara pranidhana* is conceptualized in terms of

self- or god-realization, depending, to some extent, on the socio-historical era of yoga; more is said about this in the next chapter.

This understanding, it should be clarified, while accepted for the present argument, is not trying to represent the idea of meditative consciousness having a "mystical" quality as universally accepted. Phillips (1985), for example, questions Eliades's mystical reading of the *YS*, asserting that some of the ideas could not be empirical, even mystically empirical. He goes on to argue that even if the mystical psychology of *YS* were phenomenologically sound, the character of many *YS* claims are concerned (wrongly) with supporting the dualistic theory. In this sense, the claims seem to more reflect the nature of yogic "experience." Thus, there are arguments that the *YS* should be regarded more as a work of speculative metaphysics, or at least equally as a work of mysticism.

However, mystical accounts of meditative absorption could be interpreted as experiential or phenomenological rather than asserting veridical claims about the empirical nature of self and reality. Along these lines, Flood (2006) argues that tantric texts, especially those with instructions regarding yogic practices, were intended to be used and interpreted in the context of praxis and not for philosophical insights into the nature of the world. This alternative interpretation – that is, that the yogic model reflects the phenomenological reality of meditative phenomena – is the view I wish to develop here. This is not to say, however, that experiential knowledge should bear no metaphysical implications. Quite to the contrary; and theories of the mind in the intersections between science and meditative absorption carry an implication central to my comparison between these same two systems.

Relational Dynamics and Gaining the Qualities of *Ishvara*

To understand the mental processes involved in the phenomenology of yogic trance induced through the practice of *ishvara pranidhana* (and the underlying neuroscience) the mental processes of meditation and yogic praxis must first be seen, as explained above, to occur in the context of the yogin relating to *ishvara*. First of all, what value and benefit this relational dynamic might have for the practitioner should be examined to understand what motivates practitioners to enter into such a relationship. Chapple (1994), and others (e.g., Eliade, 1958; Whicher, 1997; Connolly, 2007), point to *YS* 2.15-2.17 as a pivotal and defining feature of the meditation process. This passage highlights how life is suffering, and by practicing yoga (e.g., the practice of *ishvara pranidhana*) one can overcome suffering. Thus, overcoming suffering is the liberative goal of yoga. Furthermore, the mental processes of *ishvara pranidhana* meditation can be understood as something that happens within the person through this relational dynamic, because it is by relating to *ishvara* the person gains the qualities of *ishvara*. Thus, it is by gaining these qualities that the person is relieved of suffering.

Pfleuger (2005) points to *YS* 1.24 to define what these qualities are and how one relates or develops them, as a special or particular kind or instance of Self or *purusa.* This *purusa* is distinct and separate from all other individual *purusa*-s because *ishvara* is neither ignorant, nor bound. In Eliade's (1958, p. 74) words, "*ishvara* is a *purusa* that has been free since all eternity." Pursuit of *ishvara* and the concomitant freedom from constraints of materiality thus plays a central role in the goal of yoga.

In a metaphysical sense, the individual *purusa* (personal spirit or consciousness) practices yoga to be free from the bonds (*gunas*) of *prakrti* (matter) because they create

suffering. It seems possible therefore to analyze the relational dynamics between the meditator and *ishvara* as the object of meditation on at least two levels: the psychological (or personal) and the cosmological, roughly analogous to normal concepts of self and world, or self and god. The psychological level pertains to the mental processes of meditation that come from concentrating one's attention and all of one's mental and emotional resources on *ishvara*, while the cosmological level relates to the reality of *ishvara*.

However, a closer consideration of the reality of *ishvara* and the state of absorption as understood from the yogic perspective suggests that seeing the meditator and *ishvara* on these two levels (personal and cosmological) is not consistent with the worldview of yoga, and especially the nondualism of tantric yoga. The reality of *ishvara* is subjective, and not an objective "element" or "being" that is "out there." The reality of *ishvara* is omnipresent. This means that *ishvara* also exists within each person and any distinctions between the self and an "other" (e.g., *ishvara*) do not exist except for experientially in a moment when a person is unaware of the presence of *ishvara*. What it means for the meditator to gain the qualities of *ishvara* is to gain this state of freedom from the normal boundedness that, in of itself, generates the separations and distinctions that yield the sense of self and cosmos.

Being in a state of a certain quality of unboundedness reflects the yogic state of absorption (*samadhi*) and the unbinding process is tied into the mental processes of memory (*samskara*) that will be explored throughout this chapter. A third process of *Samadhi,* or how mantra recitation generates the "mystical" effect in the mind, is then

discussed and explicated through the lens of tantric yoga to analyze this process in terms of how the technique itself works.

In addition to examining the context of the individual relating to *ishvara*, there is the socio-historical context that shapes how mental processes of meditation are understood, another important context. The qualities and reality attributed to *ishvara* as the particular *purusa* at the focus of *ishvara pranidhana* depend on the stream of yoga under consideration.

The point of this discussion is that the relational dynamic between the meditator and the object of meditation, i.e., *ishvara* (god), generates the basis of the meditator's perceptions about his own experience (that can be constituted in suffering or not) and identity. Specifically, the idea is that *ishvara pranidhana* in the *Yoga Sutra* is about concentrating the mind on *ishvara* or god, and generally that concentration is a vital and necessary step in any meditation method.

Naturally, questions arise about the reality of *ishvara* and how meditation processes help the meditator gain qualities of *ishvara* by the meditative act of relating to *ishvara,* thereby alleviating suffering. At the least, *ishvara pranidhana* leads to a state characterized by qualities (or feelings) of freedom, unboundedness, purity, and knowledge.

In the next chapter, Anandamurti's particular method of *ishvara pranidhana* will be explored, particularly for its definition and analysis of mantra, which lies at the heart of his method. The role of mantra in concentrating the mind and enabling access to the reality of *ishvara* also will be treated later in this chapter, and then again as a theme in part three where it is discussed in the tantric yoga tradition in comparison with the

neuroscience concepts of attention, memory, and emotion. First, the reality of *ishvara* and thus the state of absorption that one enters into during *ishvara pranidhana* must be examined in tantric yoga meditation as presented in the classical literature.

Traditional Views of Tantric Yoga Meditation and States of Absorption

Anandamurti claims that his twentieth century meditation method of *ishvara pranidhana* is a tantric yoga practice. Elements or strains of traditional tantra and yoga that appear identifiable in *ishvara pranidhana* practice have been found in Classical Yoga's main text, the *Yoga Sutra*. To understand the second mental process, *samskara* ("memory trace" or memory from the etic perspective), and then the third mental process of *samadhi* ("absorption" or what parallels emotion from the etic perspective in this comparison) it is necessary to examine these tantric yoga perspectives. This section is thus dedicated to the mental processes involved in tantric yoga meditation from traditional perspectives: *samskara* and *samadhi*.

Readers might note that this sort of approach that examines different streams of the yoga tradition can leave one wondering what it is that makes yoga "yoga." Is there some aspect of yoga that transpires or remains recognizable among the various yoga traditions? I believe that the mechanical transformations of yogic praxis as described in the Classical Yoga literature come about during any method that is yogic in nature. Because of this extension, we can infer that the mechanisms described in the *Yoga Sutra* are there in any yogic practice, potentially regardless of socio-cultural and historical contexts in which yoga is practiced. If we accept that there is this enduring timeless quality or condition, then this recognition gives my analysis of tantric yoga some

continuity, and thus illuminates our understanding of what makes yoga "yoga." Thus one might assume that some core yoga processes apply regardless of what yoga tradition is being examined.

Now that we have understood that there are certain mechanical happenings that function as the enduring quality of yogic praxis embedded within any socio-cultural or historical rendering of yoga, we will turn to examine the basic mechanistic dynamics of yogic praxis in greater detail with a special focus on explicating the second yogic process of *samskara* (memory trace).

The Mind

To understand meditation from the yogic perspective, one must see the function of mind (*citta*) as reflecting consciousness within the material world. This view draws from the Samkhya metaphysical philosophy (Larson, 1969). In any mental state, *citta* (mind) fluctuates reflecting how *purusa* (consciousness) interacts with or permeates the phenomenal world. These mental fluctuations are known in yoga as *cittavrtti* or mental processes (Eliade, 1958; Miller, 1995). They (*cittavrtti*) may be like waves in a storm, ripples on a lake, or the stillness of a pond; the degree of fluctuation differently affects the perceptual processes because such activity of the mind colors how an individual perceives the world. Whereas with a totally clear mind one will recognize the reflection of consciousness (*purusa*, or *ishvara* as a special type of *purusa*) as one's true identity, during fluctuations, one will identify with those objects or qualities as perceived. By practicing yogic techniques, an individual can quiet the fluctuations to the point where

the *citta* (mind) can clearly reflect *purusa* (consciousness). Thus Eliade explains that in yogic states, one recognizes one's own ultimate identity, the spiritual goal of yogic life.

The Mechanisms of Meditation: Yogic Praxis in the Yoga Sutra of Classical Yoga

Chapple (1994, pp. 97-98) suggests that Patanjali "substitutes his own philosophy of *kleshas*, *samskaras*, and *vasanas* [a type of *samskara*]" for the subtle body or mind so clearly emphasized in Samkhya. Because this subtle body is subsequently further developed in tantra and elaborated with notions of *chakra*, *nadis*, and *kundalini*, it might be inferred, too that these "subtle body" features described by Patanjali (e.g., *kleshas*, *samskaras*, etc.) could operate during practice within the tantric body. Thus, these "mechanics" – that is, the transformation or change processes of yoga praxis - are what I have in mind when I talk about the mechanics of the tantric yoga meditation method of *ishvara pranidhana*.

These mechanical transformations of the mind are the description of the yogic process. The *YS* implies that this process applies to any yogic method; therefore, logically this includes *ishvara pranidhana* and it follows that any tradition that integrates yoga into it necessarily imports these mechanics, since these mechanics are what constitute the core of yogic transformation. The only question would be whether the technique or method at issue was "really" yoga. When I talk about the tantric tradition of yoga later in this section, I am building on the basic mechanics of yoga, and assuming that the tantric yoga methods of medieval India were, indeed, yoga. The philosophy and methods changed in important ways, but this basic core mechanical process of the mind remains as yoga, meant here in the "process" sense.

Whicher (2005) offers a detailed explanation of the samskara process in which he explains that for yoga, mind (*citta*) is where all the cognitive, affective, and emotive processes take place. According to Samkhya-Yoga philosophy (Eliade, 1958; Larson, 1969), all of the manifestations and mechanical activities of the mind (*citta*) come within the realm of *prakrti* or matter, and thus because they occur within an individual mind during meditation, we can imagine that they occur within *citta* within the matter of the body. According to yoga (Eliade, 1958), an individual's collection of *samskaras* plays a major role in individual identity and sense of self. This collection of mental impressions that drives actions is regulated through the production of different kinds of *samskara* through any action including meditation. Whicher (2005) explains that the *Yoga Sutra* (YS 3.9) asserts that there are two kinds of *samskara*: externalizing *samskara*, which leads to an afflicted sense of self-identity, what Whicher calls one's karmic identity, and interiorizing *samskaras*, which lead to *nirodha* (cessation) of the externalizing processes of the mind and to liberative states. Ultimately *nirodha* leads to realization of one's intrinsic identity as *purusa*. Because people engage in most actions in ordinary states of mind in which one perceives oneself as separate from the world, most actions generate karmic *samskaras*, or those *samskaras* that bind and constrict the mind, as opposed to liberating it. In contrast to ordinary states of awareness, states of absorption generate liberative *samskaras*, and, as explained below, this alleviates suffering.

Patterns of Mental Fluctuation and Quiet

The Yoga Sutra 1.5-1.11 enumerates five patterns of mental fluctuations that all operate to color yogic perception (Feuerstein, 1979). Valid cognition (*pramana*), error

(*viparyaya*), conceptualization (*vikalpa*), sleep (*nidra*), and memory (*smrti*) are the main *cittavrttis* or modifications (processes) of the mind. These are the modes through which the mind reflects pure consciousness. While this list is not exhaustive of all possible mental processes, it does outline major or broad categories within which most if not all mental processes would fall (Whicher, 1998). These processes reflect consciousness and, according to yoga, individuals identify with these reflective mental activities in ordinary waking consciousness.

Valid cognition is central for understanding both ordinary states of mind and yogic perception attained in meditation - it is the mental process that must be attained to achieve yoga. Perception, inference, and valid testimony are all different forms or ways of knowing when one has valid cognition (YS, 1.7). More is said later in this chapter about valid cognition.

Error, a second main mental process (*cittavrtti*), occurs when one's cognition or understanding does not correspond to reality. According to yoga, the primary cognition at issue is an individual's identification with the activity of the mind. This is because identification with mental activity (rather than some deeper reality) engenders a false sense of self. In such a state of (false, according to yoga) identification, one's identity is incorrectly defined within the individuated psychophysical being or personality complex and not according to the unbound nature of the spiritual self (*atman*) (Whicher, 1997). The important yoga concept of mental affliction (*klesha*) comes into play under this mental process because Vyasa (YB 1.8, as described by Whicher) equates this sort of cognitive error with ignorance (*avidya*). *Avidya* is the fundamental affliction of the mind (*klesha*), and most basic error of wrongly identifying with reflected consciousness. This

"ignorant" perception of separateness between the phenomenal world and spirit is a cognitive error of a mistaken conviction about one's identity. It is from this core affliction that other *kleshas* (mental afflictions) arise, including our mistaken identity as an individual, egoic the sense of "I-am-ness" (asmita) (Whicher, 1998). From a mistaken identity one develops three other afflictions, as well: attachment, aversion, and the desire for continuity. Together, these five conditions, both singularly and collectively, are all the basic groundwork of the afflicted personality. More will be said shortly about these afflictions (*kleshas*).

A third *cittavrtti* is the mental process of conceptualization. Conceptualization occurs when an idea rooted in verbal knowledge does not correspond to an actual object, but is different from error because it can serve a useful function for cognition. De Wit (1991) writes about the conceptualized experience of me in a way that I think shows a nuanced relationship between the affliction of "I-am-ness" with cognition. When operating out of egoic consciousness, one considers oneself in ways that might not match with reality. De Wit also writes about "two types of knowing" conceptual vs. non-conceptual, supporting the notion of yogic perception existing outside of the normal mental processes since, Patanjali suggests, during yoga, such as the practice of meditation, conceptualization processes cease to function. In addition to this core epistemological value, *vikalpa* (conceptualization) is also important in meditation for strengthening and focusing the mind; for example, during meditation one focuses on the concept of a higher or spiritual self.

Sleep (nidra) is also named as a primary *cittavrtti* (YS 1.6; 1.10). Feuerstein (1998) explains that for yoga, the transcendent self witnesses the contents of

consciousness that occur even during sleep states. Thus, meditation must somehow "intercept" the flux of ordinary mental activity even in this state. Feuerestein, like others, also explains that sleep is due to a prevalence of *tamas* the *guna* (or binding force) dominated by the quality of inertia that is overcome through meditative practice.

Lastly, Patanjali names memory (*smrti*) as one of the five main types of mental activity that cease to function during yoga. *Smrti* is a recollection of past events or experiences. One of the important relevant notions about cognition in the form of *smrti* is that in yoga, memory is not considered as a valid source of pramana (knowledge) because, as Larson (1993) explains, the causal conditions that produced the previous experiences – which are stored as memories - are not necessary for a reproduction. Although not pramayana (knowledge), *smrti* (memory) plays a crucial role in cognition, such as, for example, in determining the nature and range of cognition (Larson). This mental process deserves close examination because of its "sameness in form" with mental impressions (*samskaras*) (YS 4.9), and *samskara* is in a reciprocal causal relationship with all mental processes.

The Build-up of Mental Impressions

Of central importance to understanding meditation is the idea that experience created through activity of any *cittavrtti* (mental process) leaves impressions in the deep structure in the mind (*citta*), where they await fruition in the form of volitional activity (Whicher, 1997). These impressions are known as *samskaras* and are central to our analysis because meditative absorption affects this collection of impressions and thus their effect on individual experience and action. Thus the processes surrounding

samskara comprise the second mental process. Memory (*smrti*), one of the patterns of *cittavrtti* (mental processing), plays a special role in the generation and extinction of mental impressions, because mental impressions (*samskaras*) result in memories (*smrti*), and memories themselves generate their own impressions (*samskaras*) (Whicher, 2005; YB 1.5 p. 10 Vyasa). Whicher explains that a cyclical causal relationship exists between memories (*smrti*s) and mental impressions (*samskaras*), and, in fact, between *samskaras* and all mental processes. Each generates and feeds the other, thereby sustaining mental life.

The Cycle of Mental Impressions and Pain

Another idea that is central to understanding the soteriological purpose of *ishvara pranidhana* meditation is that *cittavrttis* can be either painful (*klista*) or non painful (a*klista*), depending on whether the impressions (*samskaras*) internalize or externalize consciousness. The *cittavrttis* (mental processes) involved in sustaining an ordinary sense of self are known in yoga as *klista-vrtti* because pain and affliction characterize these mental processes. In contrast to these, *aklista-vrttis* are characterized by the absence of pain. YS 2.15-2.17 claim that yoga can alleviate the suffering of *klista-vrttis*. How can one understand the nature of non-painful mental states within the yoga system, and especially how meditation aids in the creation of unafflicted mental conditions that are essential for psychological well-being?

Vyasa explains that painful mental processes (*klista-vrtti*) are caused by *kleshas* (Whicher, 1998). The concept of *kleshas* has been translated as both the "forces of corruption" (Miller) and the "causes of affliction" (Feuerstein), and *kleshas* express

themselves in any of the five modes of consciousness (*cittavrtti*). Patanjali (*Yoga Sutra* 2.3) identifies and defines five *kleshas*: ignorance (*avidya*), egoism (*aham* or *asmita*), attachment (*raga*), aversion (*dvesa*), and the will to live (*abhinivesa*) (Miller, 1995). These *kleshas* encapsulate the psychological behaviors leading to suffering. Feuerstein (1979) explains that *kleshas* are basic motivational forces that prompt or motivate a person to act, think, and feel. Whenever any of the forces of corruption operate, this activity creates the five modes of mind (*cittavrttis*), and activity of *cittavrtti* is precisely what yoga seeks to quiet during meditation and other yogic means.

The first *klesha*, known as *avidya*, or ignorance, is "the field where the other forces of corruption develop, whether dormant, attenuated, intermittent, or active" (Miller, 1995). The Sanskrit word *avidya* means ignorance. In a waking state, a person is in a state of consciousness whereby the mind is having a thought or, often, many thoughts. As will be reviewed in chapter five, neuroscience agrees with this concept. Numerous studies of subjects in waking states reveal that ordinary perception is often quite flawed, and the yogic concept of *avidya* reflects this state of mistaken perception. The mind is aware of objects in the world, and has the consciousness of self as separate from those objects. Thus in a state of *avidya*, the individual exists within the epistemological condition of a subject-object duality. *Avidya* (ignorance) of the nature of one's mind as material and that Brahman (ultimate reality) exists as the principle of consciousness, which guides movements from the subtle to the crude (Anandamurti, 1959). In other words, the force of *avidya* (ignorance) pulls away from the "cosmic hub," instead of moving closer to it, which is the movement of meditation's spiritual progress (Anandamurti). So whereas Brahman as the cosmic hub is an attractive force, *avidya*

(ignorance) is the repelling force. The mind's pulling away from experiencing absorption in and cognitive identification with *Atman* is caused by its attraction to the sensory and phenomenal world. The experienced state of *avidya* causes the perception of separateness since the person identifies with the turnings of his or her own thoughts instead of with the *Atman* as the true core self.

When attention is turned out into the world, this worldly input can overwhelm the nervous system and can also bind the mind with *rajas* and *tamas*, leading to negative psychological experiences and psychological "blocks." An individual's feeling of "I-am-ness" results from one's ego and this sense of self is constructed by the mental processes. Resulting from the wrong identification with phenomenal consciousness, the sense of "I am-ness" carries with it the false belief that one exists as a conscious being in separation from other entities. Meditation seeks to sublimate the "I" feeling, by concentrating on the spiritual nature of oneself, rather than the perceptions of separateness that mark one as distinct from the rest of perceived reality. This perceptual experience of separateness from *purusa*, or spirit, stems from a false identification with the phenomenonal world is based on sensory experience because sense contact with objects perturbs the mental field of *citta* creating impressions (*samskaras*) deep within the mind, and this vibratory perturbance creates *samskaras*, or subliminal impressions. These subliminal impressions (*samskaras*) are central to any cognitive experience.

Two further *kleshas* arising from errant mental process and from the mind existing in a state of spiritual ignorance are attraction and aversion. Misidentification with the phenomenal world (*avidya*) leads to core affective processes of attachment to and aversion from objects in the perceived realm, and both cause suffering (*avidya*)

(Miller, 1995; YS 2.24). These afflictions occur when an individual's "I-am-ness" controls action. Whicher (1997) points out that attraction and aversion are the "emotive core" of the yogic concept of affliction, signifying an affective dimension to thought (*vrtti*).

Lastly, the final affliction arising from this state of spiritual ignorance (*avidya*) in which an individual perceives one's self as separate from the rest of the world, is an existential anxiety that occurs when one feels vulnerable to extinction. The will to live (the fifth *klesa*) is one's desire for continuity (*abhinivesa*), stemming from *avidya* – a misunderstanding of spiritual identity – and egotistical attachment to one's life in the form of the present body and conditions. One notices all around oneself the impermanence of worldly existence, that objects in the world do not last. When one's own identity is individuated in an egotistical sense of I-am-ness rooted in worldly existence, a gripping sense of anxiety overcomes the mind because one recognizes that one's self will come to an end. *Prajnana* (insight) or yogic perception of one's eternal inner nature satisfies this desire and allows one to let go of the fear of extinction. Together, these afflictions (*kleshas*) provide a cognitive-motivational framework for the ordinary person enmeshed in a conditioned existence and unaware of *purusa*.

Meditation Eliminates the Cycle of Mental/Emotional Pain

As the core affliction, *avidya* or identification with the "turnings of thought" is the cause of any of various *cittavrttis*; however, through yoga, awareness of the mind's activity is cultivated so that the yogin "awakens" to the reality of *purusa* (spirit or consciousness) and this awakened awareness counters the (false) perception of

separateness of self from the world. Anandamurti (1962) explains this relationship between the concepts of *klesha* and *cittavrtti* in terms of dependence, in that the *kleshas* are dependent on various psychic propensities (*vrtti*s), especially the propensity of defective cognition. For example, *kleshas* can arise in memory, sleep, cognitive error, conceptualization, or valid inferences, thus there is also a cyclical relationship between *klesha*s and *cittavrttis*.

Whicher (1998) takes issue with Feuerstein's assertion that all mental activity is *ex hypothesi* engendered by the *kleshas*, and proceeds through a careful analysis of classical writers Vi*jnana* Bhiksu, Vacaspati, Vacaspati Mishra, Ramananda Yati, and Bhoja Raja who all support the position that Whicher argues: that *aklista-vrttis* do not result in affliction. Whicher shows that this insight into the unafflicted nature of *aklista* (non-painful) mental processes comes from recognition of "the soteriological purpose of *vrtti*," which is to lead to liberated knowledge (*jnana*) (YS 2.28). Thus, while *klista* (affliction) characterizes ordinary mental states, the cycle of causality between *klesha - klisti vrtti – klesha* can be shifted to the generation of *aklista-vrttis* (unafflicted mental processes).

The central tenet of yoga's path to psychological well-being is that mere awareness that *cittavrttis* are impermanent states of consciousness and not central to one's identity liberates one from attachment to the mind's destructive activity (Eliade, 1958; Feuerstein, 1979). In this way, the mind is freed from its afflictions and consequently resides in a state of peacefulness. Whicher (2005) explains that overcoming *klista-vrttis* (painful mental fluctuation) of an afflicted identity and sense of self is the process of yogic transformation and this path begins when one attempts to recognize

one's own real identity. Thus, he argues, *samskaras* are centrally important to identity not only because they contribute to the mechanism of our karmic identity (and its entanglement within *prakrti* or matter), but because they have a role in spiritual liberation as well.

Directing the Mind Inward**.**

Suffering also relates to a causal relationship between the *samskara* (or impressions stored in the mind) and *cittavrtti* (or the mental processes of the mind). For yoga, the cyclical causality of afflicted mental processes is driven by mental impressions (*samskaras*) accumulated through phenomenal consciousness, that is, when consciousness is directed outward into the world, impressions in these states of consciousness generate karmic *samskara*. This cyclical causality usually produces karmic *samskara* when the *samskara* drives consciousness outward, or produces liberative *samskara*, as is the case for *ishvara pranidhana* during states of absorption when the *samskaras* drive consciousness inward. Thus, impressions that externalize consciousness lead to afflicted self-identity while impressions that internalize consciousness lead to mental quiet and recognition of one's own intrinsic identity as *ishvara* (a special type of *purusa*).

Whicher (2005) goes on to note that, once generated, impressions or *samskaras* also have internal currents or a flow of their own, currents that influence or affect a person's intentional and volitional nature. This idea supports Anandamurti's definition of *samskara* as "reactive momentum." Feuerstein (1990, p. 309) calls *samskaras* "highly dynamic forces … [that] constantly propel consciousness [i.e., an individual] into action." Thus Feuerstein's description of mental impressions similarly evokes the idea of

samskaras as having movement. What propels this movement (from externally to internally directed consciousness, and vice versa)? To explain this aspect of mental functioning, Anandamurti draws from yoga's metaphysical system.

Whicher (1998) explains that the concept of *samskara* is explained by the notion of seed or *bija*, which can denote the afflictions (*klesas*). According to Anandamurti (1959), the primary affliction *avidya* (ignorance) guides movements from the subtle to the crude. In other words, the force of *avidya* (ignorance) pulls the mind away from the "cosmic hub," which is *purusa* (spirit) or Brahma (ultimate reality), instead of moving closer to it. The mind's pulling away from experiencing absorption in and cognitive identification with *atman* is caused by its attraction to the sensory and phenomenal world; i.e., its drive to experience the world. In contrast to the externalizing movement of *samskara* drawn by the affliction of ignorance, the movement of meditation's spiritual progress is a centripetalization, a movement towards the center. So whereas *avidya* (ignorance) is the repelling force away from consciousness, Brahman as the "cosmic hub" is an attractive force, that is, Brahman attracts the mind (Anandamurti). As for the location of this cosmic hub, for yoga, Anandamurti explains that there is no one single permanent location of Brahman (ultimate reality) *purusa* or consciousness bounded by time and space. Instead, consciousness is believed to be everywhere always existing. Consciousness is an attribute of reality, of existence itself. The extent that an individual's mind clearly reflects consciousness in its processes (in the sense of pure or cosmic consciousness) determines the degree of freedom from the *klista-vrttis* of suffering, or, in other words, the degree of psychological well-being.

Binding and Freeing the Mind**.**

This whole psychological process of yogic praxis is grounded in a Samkhya-Yoga metaphysical emanation theory that is differently interpreted in various yoga traditions. A main idea to glean from this theory as it bears on understanding the mental processes of *samskara* during meditation hinges on Samkhya's idea that there are three cosmic forces that variously bind matter (*prakrti*): the *gunas* (binding forces) (Larson, 1969). Like all aspects within the realm of *prakrti*, Whicher (2005) explains that *samskaras* are under the influence of the three binding forces (*gunas*) that regulate the qualities of worldly existence as they operate within the person's mind: *sattva guna, rajas guna*, and *tamas guna*. The *Bhagavad-Gita* (chapter 14, especially 14.5-14.18) describes various qualities of the *gunas*. Swami Rama (1972) explains that *sattva* is the quality of clarity and luminosity, bringing peace, calm and serenity; *rajas* is the quality of activity, it is active and full of desires, attachments, and enjoyments; and *tamas* is the quality of dullness and staticity, producing inertia, confusion, delusion, and ignorance. These forces rule every quality within the realm of *prakrti* (Larson, 1969), and this includes the qualities of mental states. In the realm of the mind, for example, Whicher (1997, 1998, 2005) explains that *tamas* and *rajas gunas* dominate the externalizing *samskaras* (impressions) and mental processes (*cittavrttis*), while internalizing impressions and mental processes are under the influence of *sattva guna* – the sentient quality that brings clarity. He explains that the binding forces of the three *gunas* generate the painful or pain-free states associated with *klista* or *aklista cittavrtti* (mental processes). As discussed above, the goal of yoga is the cessation of the *kleshas* that operate within an afflicted identity and are held in place by the forces of the *gunas* (Whicher, 2005). Yogic practices

such as *ishvara pranidhana* meditation cultivate the cessation of the *tamasic* and *rajas*ic influence over the meditator's psychophysical being, such that the *sattvic* qualities of clarity and luminosity come to dominate the mind. Anandamurti explains that this is the purificatory dimension of practice. Yogic techniques purify the mind of the *klista-vrttis* (painful mental processes), *vasanas* (habit patterns), and *samskaras* (reactive momentum) that all hold in place the worldly identification via the binding force of *tamas* and *rajas*. No longer under the *tamasic* and *rajasic* forces, the mind ceases its externalizing direction, and, under the sway of *sattva*, switches course to instead move "inwardly" towards Brahma, the "cosmic hub." In this way, the mind is brought to a state that can clearly reflect the light of consciousness (*purusa*). In this purified state, the mind is rooted in knowledge; knowledge of oneself as essentially spiritual permeates awareness. Thus, for yoga, psychological well-being is tied into cosmic processes and depends on how the *gunas* bind an individual's worldly or spiritual experience within the mind (*citta*).

According to Samkhya-Yoga philosophy, these cosmic forces rule "the emergence or process of evolution of the manifest world [*prakrti*]" that occurs only by "the fact of the presence or proximity of *purusa* [spirit or consciousness]" (Larson, 1969, pp. 192-193). Larson explains how the *gunas* regulate the successive emergence from *prakrti* of the various aspects of the mind, intellect, etc., and then the five *tattva*s (elements), all forming the progressively cruder forms of the material substance of *prakrti* (matter). The Classical Yoga literature picks up from this point to explain the involution process of enlightenment whereby each of these entities progressively withdraws from "cruder" matter or absorbs into the more subtle forms of *prakrti*. Miller

(1995, p. 47) explains this idea as it is expressed in YS 2.10: 'Reversing their course' of the subtle forces of corruption is a kind of involution, the opposite of evolution."

One of the challenges of understanding Classical Yoga scholarship is to reconcile the predominantly interpreted dualism of Samkhya that results from the distinction and separation between *prakrti* and *purusa*, and the phenomenological claims of oneness during yogic mystical transcendence of individual consciousness with *purusa*. One potential avenue towards understanding both the metaphysical and phenomenological claims is to see Yoga philosophy as non-dual. Anandamurti takes this perspective, for example, by claiming that ultimately *purusa* and *prakrti* are two sides of the same coin, that Brahman is a composite of these two. Thus for Anandamurti, *mahat* (a subtle aspect of mind) emerges from Brahman (as the composite of both *prakrti* and *purusa*) rather than from *prakrti* alone; the rest of the process is similar except that Brahman is understood to be merged with all manifested forms rather than just in close proximity. From this perspective, which is explored in greater depth in the following pages on tantra, the emergence of *mahat* from Brahman occurs as *sattva guna*, and comes into dominance over the other two *gunas*.

In the section on tantra below, we will see that the Samkhya interpretation of dualism that posits *prakrti* (matter) and *purusa* (spirit) as two separate ontological categories contrasts with the medieval tantric yoga interpretation of *purusa*, called Siva (although there are a number of prominent deities in tantra, Siva stands as the highest or most predominant (Flood, 2006)), as the singular primary ontological category with an emanational relationship to *prakrti*. Matter emanates or emerges from god (Siva) but is never separate from it, instead, there is a "continuous cosmogony" that exists as the

manifest world emanates directly from Siva and flows back again (Muller-Ortega, 1992, p. 227). Thus, for tantric yoga, the feeling of oneness in *samadhi* is a state of relatedness within the world whereas in Classical Yoga the state of *samadhi* has been interpreted as a state of separateness from the world.

Another way of focusing the metaphysical system of yoga on psychological processes is to examine the shift from discursive to discriminative mental processes. Whicher (1998) explains that ordinary mental states, in which consciousness is externally directed so as to apprehend the world, are characterized by discursive cognitive mental processes. This discursive nature of such processes means that the individual perceives a separation between self and the world, what Chapple (1994) calls a subject-object epistemology, and this perception underlies suffering. However, shifts in perception of self-identity brought about by yogic practice lead to discriminative mental processes in which the individual comes to recognize the continuity between self and the world (Chapple). Feuerstein (1979, commentary on YS 1.41) explains that these sorts of identification processes underlie absorption (*samadhi*). YS 3.54 suggests that this recognition of non duality liberates one from all conditions (Chapple, 1994). Chapple explains that when the mind's processes are more discriminating, perception of reality becomes clearer and it is only in such states can the mind discriminate or discern ultimate reality. In yoga, this insight of non duality is experienced as oneness because the individual sense of self has become absorbed into the sense that one is identified with the whole cosmos. Discursive and discriminative mental processes are two types of knowing that are examined within each of the mental processes examined in chapter five. Now we will examine how various tantric streams view yogic praxis.

Tantric Embodiment of Yogic Praxis:

Explicating Samadhi and Stages of Embodied Absorption

A central question of this chapter is to examine yoga praxis from the tantric perspective. This section has the goal of identifying what makes a yoga practice tantric, and what absorption or *samadhi* means from this perspective. These issues are important because the typical interpretation of Classical Yoga is that it is a dualist system, and this contrasts with the non dual philosophy of tantrism though this is not always the case as Yoga is also interpreted in nondualistic terms. What does non dualism mean for the cognitive processes of *ishvara pranidhana* meditation? Here we focus on examining the tantric yoga state of *samadhi* first by probing into the function of mantra. I then consider the tantric elements of visualized meaning of mantra in the tantric subtle body by examining selected streams of tantric mysticism that all advance an understanding of the third mental process of meditation: *samadhi* or absorption.

Turn to Tantra for Explication about Mantra

Oberhammer (1989) explains that one of the primary processes of theistic meditation is typically mantra recitation (though not always), and, as we have been discussing, mantra is a central process to Anandamurti's method of *ishvara pranidhana*. Therefore, let us examine the role of mantra in *ishvara pranidhana* to see how it helps our understanding of the yogic process of *samadhi*. *Samadhi* in the YS is about the recognition that one's self is the same as separate consciousness, and the state in which the individual consciousness resides in that separateness (Eliade, 1958; Chapple, 1982; Whicher, 1997; Feuerstein, 1998); like other yogic practices, Timalsina (2005) explains,

the purpose of mantra is to bring the *citta* (mind) to rest in its true nature of awareness (*cit*). The individual endeavors to transcend the individuality residing in the body and mind, and this effort results in one's ability to perceive as a witness, to freely roam the different mental states without becoming engaged (Timalsina, 2005). Yet mantra is thought to intensify yogic practice (Oberhammer, 1989). How do these processes of mantra bringing the mind to rest and intensification of practice occur? Perhaps because Patanjali's Yoga is largely a non theistic system, the YS offers quite a limited discussion of mantra (Oberhammer, 1989).

The little that is said about mantra and theistic *samadhi* in the YS is given in two sutras: YS 1.27-1.28. In these two sutras, Patanjali explains that the function of the *pranava* (OM) mantra is to denote god, thus many scholars argue that this is not a linguistic function (e.g., Oberhammer, 1989; and see Alper, 1989). Oberhammer (1989, pp. 204-205) highlights this issue and claims that "the whole mantra problem and its meaning for the act of meditation is brought into focus" in these two sutras: he argues that interpreting *pranava* (the mantra OM or cosmic vibration) as a trivial linguistic denotation (as he thinks is the case in the YS 1.27), though, is a mistake.

Alper (1989) highlights the unresolved issue of the linguisticality of mantra, citing Staal as a long time proponent of the position that mantras are alinguistic – that is, utterances whose meaning comes from the ritual act rather than any prescribed linguistic meaning. However, Alper points out that others, for example himself and Wheelock (1989), assume that mantra generally is a linguistic phenomenon, though none argue for this position directly and, furthermore, that until someone argues that mantra *should* count as a language then it is futile to demonstrate that any act of mantra is a speech act.

Oberhammer (1989, p. 205) highlights the linguistic problem with mantra in the YS, that "the relationship between the mantra and god, who is to be realized in the meditation … cannot be identical with the linguistic relation between word and its object in human language and has to be prior to any linguistic convention." Thus the *pranava* (OM) has a unique function that differs from the normal function of language in the fact that mantra denotes or indicates, rather than predicating, god.

Pranava (OM mantra), he argues, is actually central to attaining the transcendent experience. Perhaps mystical transcendence occurs because, as YS 1.28 indicates, repetition of a mantric syllable reveals its meaning (Miller, 1995). Similarly, Timalsina (2005, p. 214) suggests that recitation is "nothing less than a means for self-realization." Timalsina clarifies that the issue here is whether *japa* (mantra recitation) and reflection upon its meaning are two separate acts. Timalsina (p. 215) points to YS 1.28 as evidence that they are "sufficiently proximate to support the argument that these acts are performed together." Miller's (1995, p. 36) translates YS 1.28 is as, "Repetition of this syllable [AUM] reveals its meaning." Thus, I agree with Timalsina that in *ishvara pranidhana* that the speech act of mantra comes together with contemplative or reflective activity and therefore also with Oberhammer (1989) that the denoting function of mantra in the YS is not trivial. Given that *ishvara pranidhana* is a theistic meditation, the contemplation is contemplation of god; the nature of one's self as god. Oberhammer explains that for tantric yoga theistic meditation, muttering mantra is a means for constantly thinking of god, and this results in *samadhi*. Thus one effect of mantra is concentration of the mind, and this effect can be understood psychologically in terms of concentration as discussed above.

However, while at one level the power of mantra can be ascertained as a psychological one at the level of purifying the mind, Oberhammer (1989) contends that tantra (i.e., the Pasupata tantric text *Tatatika* 900AD) implies that mantra has an objectively operating power. Because, as the YS claims, *pranava* is not just predicative but indicative of god, there is also a mediating factor to mantra. Oberhammer's reading of the *Tatatika* leads him to see mantras as meditational structures whereby mantra meditation affects an actual encounter with god. Thus to some extent *samadhi* must be analyzed theologically (Oberhammer, 1989). But if one interprets the function of mantra linguistically, Oberhammer (1989, p. 205) argues that "although not negated," the specific function of mantra cannot be grasped "under the horizon of the understanding of *purusa* in Samkhya."

That there are just two sutras in the YS of Classical Yoga that pertain to mantra suggests that there is a lack of focus on mantra in the YS. Oberhammer (1989) asserts that the YS is limited in its discussion of mantra, especially regarding this denoting function and elaborating the alinguisticality of mantra. Similarly, the YS does not address the multifold meanings and visualization of mantra, most especially visualizations of *chakra* within the body while chanting mantras as a specific aspect of *ishvara pranidhana* practice (Timalsina, 2005). Although the orgins of the mystical subtle physiology can be found in the late classical Upanishads (White, 1996, p.185), the YS does not say anything about *chakras*. Nor does the YS categorize *japa* (mantra recitation) (Timalsina). Oberhammer (1989) wonders whether Patanjali even made "use of the particular function of mantra for the process of meditation." Thus for our purposes, the YS is silent about how mantra catalyzes or propels and sustains the continuance of the

meditative (yogic) process – not just the process of using mantra to focus and concentrate the mind, but also the process of linking mantra to *samskaric* liberation during yogic practices such as *ishvara pranidhana*. Therefore, we must turn to tantra to learn more about the function of mantra.

To understand theistic meditation and the deeper meaning and function of mantra, Oberhammer (1989) turns to the tantric tradition of the Pasupatas; Timalsina (2005) discusses the meditative aspects of mantra-recitation and meaning in Kashmiri tantric texts; similarly, Alper (1989) also examines the function of mantra by examining a tantric Kashmiri Saiva text; and Muller-Ortega (2005) comments on Abhinavagupta's comparison of his tantric approach to yoga with Patanjali's Yoga. In his examination of Abhinavagupta's tantric approach to yoga, Muller-Ortega (1989) shows that Abhinavagupta directly criticizes Patanjali's Classical Yoga as an incomplete form of spiritual attainment and argues how his own tantric approach to yoga is superior. Thus, Muller-Ortega's analysis reveals ways in which the meaning of yoga changed as a result of "theological innovations" of Kashmiri Saivism. He shows that in contrast to the dualism of Classical Yoga, Abhinavagupta emphasized not only the theistic nature of tantric yoga, but also its proposition of nondualism and devotional intentions, and that these are necessary for true attainment of yoga.

However, I am not sure that Abhinavagupta's "criticism" of Patanjalian Yoga fully applies to Anandamurti's yoga method of *ishvara pranidhana*. It has already been discussed that Oberhammer (1989) recognizes the theistic pathway of yoga contained in the *Yoga Sutra* via the method of *ishvara pranidhana*. Bastow (1980) also recognizes the theistic nature of *ishvara pranidhana* in the Yoga Sutra, and goes further to point out the

possibility for understanding Classical Yoga as nondual when considering this meditation avenue to yoga's goal of liberation. Note that other scholarship does interpret the Yoga Sutras and even Samkhya/ Samkhya-Yoga as nondual (see Larson, 1969 and Feuerstein, 1979, 1998). Abhinavagupta's rejection of classically understood yoga seems to be, then, more of a rejection of other non theistic aspects emphasized in the Yoga Sutras (perhaps such as ashtanga yoga) and the most prevalent interpretations of Classical Yoga as presented in commentarial literature. Therefore, I think that Muller-Ortega's insights from Abhinavagupta's writings about tantric yoga may very well help explicate Anandamurti's method of *ishvara pranidhana*. Later I draw from this tantric yoga especially to elucidate the mental processes of meditation.

Timalsina (2005, p. 221) explains that with tantric meditation, the individual endeavors to transcend the individuality residing in the body and mind, and this results in his ability to perceive as a witness, to "freely roam the different mental states without becoming engaged." Further, in tantra the non dual state in *samadhi* "envelops all other cognitive modes and is considered beyond mind and speech." Therefore, in his comparison of the relationship between Tantric and Patanjalian Yoga systems that focuses on mantra practice, Timalsina concludes that the result of mantra practice is the same in both Yoga and tantra: in both systems, practice culminates in self-awareness and the end of suffering. He contends that internalization of pranic forces (the prime moving forces of the body and universe) and reflection on meaning through inner visualization brings the tantric concept of mantra into yogic meditation.

Timalsina (2005) focuses more on the psychological level in his analysis of how the meaning of mantras functions in meditation. In this view, Timalsina draws out the

expansion of self-awareness when the meditator's "I" sense becomes a "mingled form of the world and whatever is beyond." Timalsina notes that in absorptive states, mantras are inseparable from reflective awareness, but he does not take his analysis beyond the assertion that mantras interact with subjective awareness. I think that this perspective is helpful because it takes a broad view of tantra and yoga, focusing on overarching themes and goals of practice, but is also limited since it does not penetrate specifics about ritual meditation of tantric practice that involves mantra, but not discussed in Yoga texts. Although Timalsina recognizes that the meditation practitioner experiences himself as the deity because of the act of visualization, it is unclear from his writing how this experience occurs. By delving into tantric texts, we are offered more explicit ideas about this process.

Oberhammer (1989) suggests that the mantra possesses an objective power that cannot be explained psychologically. He argues that mysticism presupposes that the meditator has purified his mind and character from impurity of emotional turmoil and moral deficiency by means of conduct and ritual practice, and once this preparatory work has been accomplished, the meditator is ready for further events. Timalsina (2005) explains that the purpose of *japa* is to recollect the pure awareness described above in the state of *samadhi*. He builds on the idea that mantras have the nature of expansion and contraction to describe expansion as leading to development and blossoming of the complete "I" sense, which is "the mingled form of the world and whatever is beyond," (Oberhammer, 1989, p. 217) whereas contraction protects the person. This emersion and return supports the elevation of the mind so that it can eventually attain the purest form. While the meditator reflects on the true nature of mantra, this action dissolves the power

of action into the power of knowledge, then into the power of will, and then back again (Timalsina, 2005).

Oberhammer (1989) speculates that mantras get their effective power only through the positive act of god, arguing that power is neither inherent in the nature of mantra or can it be treated as a *sakti* of Siva. Thus mantra is capable of transforming the potential of liberation into an event of *samadhi*, with the caveat that what is mediated has a transubjective nature (Oberhammer, 1989). Thus, another effect of mantra is that it mediates an individual's encounter with god.

Such an encounter is meaningful for the practitioner. But meanings are not conveyed by a proposition that is articulated and based on rational reflection, rather, by "indications" of god. As we saw above, denotation or indication is the function of a mantra; thus, Oberhammer (1989) asserts that mantras (themselves) merge in the concrete identity of Siva. This occurs because Siva being OM is his only way of being an object of contemplation, which is the cause of the end of suffering. Thus, OM equals god insofar as god is present as the OM mantra in the act of contemplation and thus out of his grace comes the end of suffering (Oberhammer, 1989). Here it must be restated that *ishvara pranidhana* meditation does not call for the OM mantra to be used, but rather other mantra(s). An individual mantra is given to each meditator at the time of initiation. That alternative mantras are used during *ishvara pranidhana* does not matter, because Oberhammer (1989) explains that the various forms of mantra meditation successively mediate the experience of increasingly subtle, less objective forms of Siva's presence.

In summary, we have established here that while the theistic tradition of YS uses mantra, the YS is largely silent on important questions about the function of mantra.

Because both mantra recitation and its visualization are enfolded into Anandamurti's tantric yoga approach to *ishvara pranidhana*, analyzing tantric theories and practices pertaining to mantra could likely help us advance an emic view of meditation. Alper (1989), however, points out the vast number of tantric texts addressing the "science of mantra." To explicate the particular method of Anandamurti's *ishvara pranidhana* method of tantric yoga, and because Anandamurti's system is Saivite, I will therefore limit my analysis to three strains of tantra that seem most relevant to the method and theoretical orientation of Anandamurti's *ishvara pranidhana*. I begin by tracing a few important points from the Pasupata tradition as an early example of a tantric Savite tradition of yoga practice of theistic mantra meditation to better understand the Pasupata yoga claim that contact with god helps purify the mind. I then focus more carefully on the mystical tradition of the Kashmir Saivite recognition school, especially considering tantric emanation theory in the context of mysticism and meditation. I will also briefly discuss the changes in yoga practice that came about through the Siddha yoga tradition because of its innovation in developing practices that purified the body as well as the mind as a means to mystical spiritual liberation that are especially relevant for modern yoga practice today.

"Second Order" Hermeneutical Interpretation of Tantric Yoga

However, before we enter this next discussion, I must mention a caveat regarding examinations that focus on tantric yoga mysticism. White (2003) has argued that much scholarship on Tantra – in particular, the transcendent mysticism of Abhinavagupta and Siddha yoga alchemy - has focused on "a thin slice" of what is a broader view of tantra,

and that the practices of this thin view look much different from a broader range of tantric practice. According to White and others (e.g., Flood 2002, 2006); Muller-Ortega 1988, 2005), both cremation ground ascetics and a mingling of sexual fluids between the yogin (male) and yogini "goddesses" (females) are examples of early tantric means to "becoming Siva" (for this was always the goal of tantra). However, White explains that these early practices were "cleaned up, aestheticized, and internalized in different ways" by tenth- and eleventh-century "reconfigurations" of tantra by Abhinavagupta and others: this marked a paradigm shift.

In this "second order interpretation," various aspects of sexual practice became internalized into the *chakra* system through which the *kundalini* (spiritual energy stored in the base of the spine) would rise, a system that became the basis of hatha yoga practice (White, 2003). This tantric description of yoga, combined with the tantric *sphanda* philosophy of an oscillating universe, completes the mystical explanations of tantric yoga. In other words, when the *kundalini* (spiritual energy) reached its destination at the highest *chakra* (energy center in the head), this was experienced as an orgasm-like ecstasy that also took on a mystical quality. White believes that scholarship on the mystical elements (both theory and practice) of tantra marks a secondary development of a hermeneutical transformation of an earlier body of practice into a mystical metaphysics. The common body of mystic doctrines and practices involving sexual fluids that changed during this time became reinterpreted and now understood in terms of internalized "alchemical" transformations of the body into divine fluids and substances, not unlike the alchemical process of turning metal into gold (White, 1996). This intricate metaphysics of the subtle body relates the brute matter of the gross body to the universal divine life

force that resides within each person as well as permeating throughout the cosmos, and the "bipolar dynamics of its male and female constituents, etc. was developed in every tantric school" (White 1996, p. 5).

Thus this model of the tantric subtle body developed into an elaborate system whereby the *chakra* system seemed to take on a reality within the structure of the body through its use as a visualized model of meditation. As we will see, such a translation of earlier into later transformed theory and practices was not anomalous and has repeated itself more recently to bring tantric yoga into modern times. Despite the fact that tantric mysticism seems to constitute such a "thin slice" of tantrism more broadly, examining this aspect of tantra in the context of yogic practice is called for in this analysis because of its relevance to understanding the modern day tantric yoga *ishvara pranidhana*, and may offer new insights into mental processes associated with psychological well-being.

Mantra as Ritual Practice

White (2003) writes that the "textual pedigree" of tantra's long history goes back before the fifth-century B.C.E. and continues as a living tradition today, with the heyday of tantra peaking during medieval times approximately as early as seventh-century C.E. through the fifteenth-century. Although Tantric practitioners originated as cremation-ground ascetics (a wandering class of outcastes who meditated on corpses), by the eleventh-century the tantric tradition of Kashmiri Saivism had influenced not only popular religion but also brahmanical circles, or members of the highest priestly caste (Flood, 1996; White, 2000, 2003). This was due largely to the work of Abhinavagupta, a main theologian of the Kashmir Saivite tradition who transformed "extreme tantric

ideology into a more respectable religion of the higher castes" (Flood, 1996, p. 161) by aestheticizing and internalizing the sexual practices. In fact, after the eleventh-century all of Hinduism was influenced by Tantrism and "all forms of Saiva, Vaisnava, and Smarta religion … [had] absorbed some elements derived from the Tantras" (Flood, 1996, p. 159).

Although there is great complexity in defining tantra, Padoux (2002) explains that Tantra has come to be widely understood as meaning "ritual practice" with the goal of liberation defined as harmony of the microcosm and macrocosm (see also White, 2003). But both liberative knowledge and power were accepted as goals of yoga by tantra (Jacobsen, 2005, p. 7; Lidke, 2005). Thus tantra is defined in terms of both transcendence or enlightenment and worldly success, with the specifics of ritual varying according to particular goals and cultural beliefs (Harper and Brown, 2002). For example, mantra was practiced widely throughout tantric circles and the practice of mantra was a common form of yoga in the Saiva traditions (Timalsina, 2005, p. 214 note 4). Therefore, because Anandamurti identified himself with Saivism, my focus will be on tantric Saivism generally to help explain mantra, with Pasupata as a Saivite tradition and Kashmiri Saivism being of special interest.

While the goal of more mainstream mantra practice was to accrue power and pragmatic control over supernatural entities, the goal of "tantric mysticism," which is the focus of this dissertation, was liberative – that is, spiritual (White, 2003). Spiritual meditations involving mantra and visualization that were believed to be "mystical" because of the feeling of identification of one's self with the cosmic entity were thought to awaken the *kundalini* or mystical spiritual energy located within the body and to help

attain this goal (Jacobsen, 2005). Mantras were also used because they are thought to contain seeds (*bija*s) of the gods and to correspond to parts of the subtle body and awaken divine forces in the body (Jacobsen). Thus, for some strains of tantra, yoga as meditation becomes ritual practice to attain mystical encounters with god.

Flood (2006, p. 106) describes several stages in "the ritual pattern that the initiated practitioner must follow in his daily practice." Here Flood (p. 101) draws from the Jayakhya-samhita, "one of the most important texts of the tantric Vaisnava" tradition. Although I am not discussing the Vaisnava tradition and instead focusing on the Kashmir Saivite tradition, but both claim an emanationist cosmology identifiable in Anandamurti's explanations of *ishvara pranidhana* and Flood observes that this ritual pattern or structure is found in all tantric traditions. (For more on tantra as a ritual framework, White (2006) refers readers to Brian K. Smith.1989. *Reflections on Resemblance, Ritual, and Religion*. Oxford University Press. p. 126 citing Asvala Srauta Sutra 1.1.3.) Namely, "purification of the elements within the body (*bhutasuddhi*), the divinization of the body through imposing mantras on it (*nyasa*), [and] internal worship of the deity (*antara yoga*) performed purely in the imagination" (White, p. 106) are all aspects of the pattern of tantric ritual practice that are identifiable within the *ishvara pranidhana* meditation taught by Anandamurti (among a couple others not listed here that are not identifiable in the actual *ishvara pranidhana* meditation itself, though identifiable within the whole of Anandamurti's prescribed practice). For example, initiation is a critical process of tantra that needs to occur to learn *ishvara pranidhana*, but is not dealt with in this dissertation because of space limitations. Mantra is used explicitly though out the stages of *ishvara pranidhana*, until the final stages of deeper states of absorption. Therefore, the remainder

of this section on tantra explicates these aspects of the ritual framework of mantra, visualization, and contemplation relevant to *ishvara pranidhana*. The goal here is to explicate *samadhi*, the goal state of absorption, from a tantric perspective.

Meaning and Visualization:

The *Chakra* System of the Tantric Yoga Subtle Body

Timalsina (2005) explains that mantra practice rests upon two essential aspects: a) an inward vocalic practice, which moves mantra from external utterance to inner feeling and b) realization of the mantra's multiple meanings, which requires more and more complex visualizations. Thus, he emphasizes that in tantric yoga meditation, visualization is a crucial aspect of properly using mantra. Tantric practice shifted the audible chanting from the Vedic era to silent mantra recitation, and this shift deepens the power of mantra. For tantra, *japa* (mantra recitation) is "identical" with reflection on the meaning of mantra, and visualization is part of the very meaning of mantra (Timalsina). According to this theory, practitioners are able to transform the energy flows and the expression of phonemes within the body (this is explained shortly) by visualizing the mantra(s); in tantra, visualization of mantras centers on the *chakra* or energy system within the body that is linked to cosmic vibrational sounds. Thus, visualization of the *chakra* system within the body while chanting mantras leads to the goal of yoga: a psychological or "semiotic insight of one's essential identity with the deity" evoked during meditation rituals (Timalsina, p. 215). This link between a particular technique and theories about the body and the cosmos gives tantric yoga its special status.

The literature on tantric meditation describes different models of the tantric yoga subtle body and *chakra* system as the focus of tantric meditation (Eliade, 1958; White, 2003). Perhaps the most well-known model is the six-plus one *chakra* system popularized in the West during the twentieth century by Avalon's (1919/1974) translation of the *Satcakra-nirupana* and *Paduka-pancaka* texts composed by Purananda in 1577 C.E. As described by Avalon and others (e.g., Eliade, 1958, pp. 241-244) this "standard model" (White, 2003) consists in six energy centers associated with specific locations in the body such as the base of the spine, the navel, and the heart. References to these body parts are also made in several Upanishads, especially the Yoga Upanishads, for example the Dhyanabindupanisad (Ayyangar, 2006, p. 159). The "plus one" *chakra* is located in the head, and thought to expand beyond the body. Avalon explains that the *chakras* are linked within the body to a *nadi* (channel) system of energy channels that circulate throughout the body, with the three main energy channels – the *ida, pingala*, and *sushumna* - vertically arising and spiraling along the spinal column and important for meditation. A latent spiritual energy called *kundalini sakti* is said to lie dormant in the base of the spine during normal states of consciousness that is awakened during spiritual practices. When the mental and bodily energies begin to flow through the three main *nadi* channels, then the *kundalini sakti* arises up from the base of the spine and moves up through the vertical length of the *sushumna nadi*, piercing each *chakra* as it moves up the column. The piercing of each *chakra* signifies entrance into a deeper state of absorption.

White (2003, p. 151) explains that in the *Kubjikamata*, we encounter a notion of a process of yogic refinement or extraction of fluid bodily constituents, which is superimposed upon the vertical grid of the subtle body, along the spinal column. He

explains that this text identifies a "phonematic energy," which is taken to be *kundalini* imagery but without the exact name, and that the earliest appearance of the term *kundalini* occurs in the tenth-century *Jayadrathayamala*, and this text directly relates *kundalini* to the phonemes.

According to Abhinavagupta's *chakra* model of Trika Kaula tantra, which I will summarize below, the "charkas of the Trika Kaula subtle body are whirling spoked wheels which, in the body of the non-practitioner, become inextricable tangles of coils called knots (*granthis*) because they knot together spirit and matter" (White, 2003, p. 147 cited from Silburn, 1988, pp. 25-26). In this model, White explains, phonemes are "projected upon the grid of the subtle body" (p. 152) and therefore *chakras* (energy centers) exist in this model as "phonematic" expansion and contraction. White explains a shift in the theory about the constitution of the *chakra* when in the later *Rudrayamala Tantra* and other later hathayogic classics attributed to Goraksanatha the *kundalini* becomes the vehicle for fluid rather than phonematic "transactions and transfers" (p. 152).

White has shown that in the *Kaulajnananirnaya* there is a hierarchization of energies that are identified with the five elements (and a number of sub-evolutes); this hierarchization is identified with the ordering of phonemes within the subtle body. This is reflective of later subtle body mapping to exhibit this identification of the five lower chakras with the five elements, thus showing a relationship to the Samkhya-Yoga theory of emanation (White). These theories are important because in *ishvara pranidhana* one visualizes the *chakras*, and some of the purification processes of *ishvara pranidhana* also center on withdrawing one's mind from identification with the five elements as aspects of

one's self in an effort to identify with only the deepest or spiritual aspect of one's being. Thus these theories tie the body to psychological processes in important ways that define practice techniques.

The main idea here is that the *chakra* model of a yogic subtle body proposes a system of energy centers that are transformed through yogic meditative practice. These transformations are thought to implicitly include transformations of the mind as increasingly subtle states of awareness emerge with practice. What becomes a defining issue in twentieth-century interpretations of yoga is how one is to understand the ontology of this model.

Flood (2006) explains that although descriptions of this subtle body structure have variability among tantric texts, one must recognize that descriptions of the yogic body always appear within a context of ritual and visualization. In this context, the rising of energy in the body of the serpentine energy *kundalini* - asleep in the lowest *chakra* until it awakens during meditation and rises to the highest center - is associated with mantra and levels of speech. This system of tantric physiology, then, derives its meaning and form only in the context of yogic practice. Tantric physiology must, therefore, be understood within the yogic tradition and within specific forms of practice that intend to eventuate in the experience of *kundalini*. The image and meanings of the yogic body are constrained by its texts and traditions, and therefore meditative states must be understood within this context. Flood (p. 162) argues that to seek to understand these centers outside of this context (of text and tradition) "as if they are intended as extra-textual, ontological structures is incoherent." In other words, the conflation of the yogic physiology with the physicality of the body as depicted in the modern research programs of locate the

experience of *kundalini* within the nervous system, rather that within its traditional textual context of visualization and ritual, confounds the logic of transcendence. Yet, as we will see, this is exactly what we have in the case of modern interpretations of yoga. The centeral question here is what can we make of emic claims that *purusa* is real (Fererestein, 1979, p.9)?

Experienced Mysticism of *Samadhi:* the Phenomenology of Absorption

Traditionally, *chakra* models are considered to be based in the yogin's actual experience of the subtle body (White, 2003). This belief is significant because it directly relates the *chakra* model of the subtle body physiology with tantric yoga practice and the various experiences of absorption reported during meditation.

Anandamurti elaborates on the changes in inner feelings associated with the more complex visualizations of mantra practice leading to higher states of consciousness. He does this by describing the progress made in meditation from ordinary states into higher and higher states of consciousness during absorption. These increasingly subtle states of absorption are the levels of *samadhi* and are directly associated with the *kundalini* as it rises up the *sushumna* and crosses the *chakras*. The rising of the *kundalini* is thought about in terms of relational experience. With the *kundalini* crossing subsequently higher thresholds of energy centers, the individual "I feeling" changes in relation to *purusa* (consciousness); that is, the . Individual consciousness is said to become more expanded and the experienced cognition becomes that of one's self being closer and closer in identity to *purusa*, *Atman*, or Brahma.

Anandamurti (Sarkar, 1959) describes these stages or levels of *samadhi* in terms of the relational experience of the meditator's increasingly complete identification with the ideational object of meditation, i.e., *ishvara*. As has been stated, the *kundalini* (spiritual energy of consciousness) lies dormant in the *muladhara chakra* during normal mental states. During meditation when the *kundalini* rises and crosses the *svadhisthana chakra*, the meditator enters the first stage of *samadhi*. In this stage, the meditator feels that "he or she is not alone; … [god] is also there" and this feeling "gives the person very much pleasure." When the *kundalini* "crosses the *manipura chakra*, just near the hub, the controlling point, of the pancreas, the person enjoys another sort of pleasure." This second sort of pleasure is the next stage of *samadhi*. During this *samadhi*, the yogi feels one's own "proximity" to god. The third stage of *samadhi* brings a feeling of being in "close contact, just side by side, just touching" god as the *kundalini* crosses the *anahata chakra* (energy center). As the *kundalini* crosses the *visuddha chakra* (throat energy center), the meditator experiences the feeling that "I am one with Him [god]." Thus, the feeling of oneness, and not just close contact, occurs in the fifth stage of *samadhi*. With further meditation, the meditator experiences "another sort of … [spiritual experience], still more high… [and] at that point, the feeling is that 'I am He;' that is, 'I' and 'He,' these two entities, have become one." In this stage of *samadhi* when the *kundalini* crosses the *ajna chakra* (the energy center between the eyebrows associated with the pituitary gland), the "other" and "I" have coincided. There is no difference in feeling between self and other, and the other of god in particular. This stage represents the highest stage of attainment through *ishvara pranidhana* meditation. In the final stage of *samadhi*, attained by practicing Anandamurti's sixth meditation lesson of *guru dhyana*, the *kundalini*

crosses the *sahasrara chakra* (the crown point associated with the pineal gland) and the meditator feels only "existence." This "is the supreme stage of yogic [practice]."

Thus, Anandamurti clearly associates the third mental process of *samadhi* with the different *chakras*. These stages describe the feeling practitioners have as they develop a closer relationship with *Parama Purusa* (god) when progressing through meditation. As the *kundalini* (spiritual energy) rises through each *chakra*, it grows closer and closer to encountering *purusa* (consciousness) located in the head. In conclusion, Anandamurti's stages of *samadhi* reflect relational experience – that is, between the meditator and the world - encountered en route to experiencing absorption into god.

Explicating *Ishvara Pranidhana* through Three Strains of Tantra

As mentioned above, there are a number of different streams of tantra that were practiced especially in medieval India and some that continue in parts of India and throughout the world today (Lamb, 2005). I have selected three streams to discuss here that exemplify medieval tantric yoga with the purpose of understanding what is classical Hindu tantric yoga mysticism and explicating absorption or the process of *samadhi* in this view. These three traditional tantric streams seem to be the concepts and practice techniques most visible within Anandamurti's *ishvara pranidhana*. Each of these streams is itself an illustration of "tantric mysticism," albeit, as mentioned above, a "revised" tantra. Here the focus is on understanding what makes a yoga practice tantric in the mystical sense.

Pasupata Tantra: Contact with God.

Pasupata meditation is "fundamentally different" from Patanjali's yogic meditation, because as a tantric tradition, Pasupata meditation rests on the ideas of non-dualism and contact with god (Oberhammer, 1989). Hara (1992) explains that for Kaundinya (the author of the primary Pasupata text), the idea of yoga in the Pasupata tradition is the contact between the meditator's individual soul and god (*isvara*), and that Kaundinya believes that this contact is the intended meaning of the "technical" term yoga. Rastogi (1992, p. 249, see note 8) concurs, defining yoga in Pasupata (as presented in the *Tantraloka*, an tenth- and eleventh-century C.E. text written by Abhinavagupta) as "linking self with God through mind" and noting the "imprint of attainment" in this notion of yoga.

A second theme in Pasupata meditation is purification. Oberhammer (1989) explains that the Pasupatas believe that mantra has the power to purify the mind and remove adharma (anything sinful). As mentioned above, the effective power of mantra exists by the intention of Siva. In other words, Oberhammer (1989, p. 219) explains that mantra recitation is the only way for Siva to be an object, and therefore mantra holds an "inherent transubjectivity." This means that the mantra has the power to make the transcendent present to the subject. Mantric utterance is a form of worship in contemplation and a special knowledge develops from contact enabled by mantric utterance, because contact "purifies" (Oberhammer, 1989). Because of this denoting function, using mantra during meditation enables contact with *ishvara*. Most importantly, it is a kind of contact that "purifies" the mind and yields a special knowledge (Oberhammer, 1989). Thus in Pasupata meditation, *samadhi* is about attaining a purified

state through contact with god. *Ishvara pranidhana* is a practical means to achieve or attain contact with god and Anandamurti similarly believed that there is a purifying effect on the meditator's mind because of the contact.

Later tantric traditions, especially the Kashmir Saivite recognition school of Abhinagavupta and others, prominent around the tenth- to eleventh-centuries, expounded significantly on this belief in mantras and their denoting power (Muller-Ortega, 2005). Let us turn now to their teachings to further explicate *ishvara pranidhana*.

Kashmiri Shavism: Recognition of God.

Alper (1989, p. 345 and note 1) identifies Kashmir Shaivism as "a living variety of Hinduism" connected with tantric sadhana in Northern India, and has influenced modern 19th and 20th century teachers. The main claim of tantric Kashmir Shaivism is that during *samadhi*, practitioners have a "recognition" of the truth that "subjects and objects of language and experience are both appearances of an absolute or pure consciousness" (Flood, 2006, p. 203). This means that during practice of tantric yoga, practitioners come to recognize themselves as a manifestation of god (Siva). This recognition or insight is also the goal of *ishvara pranidhana* meditation. The recognition is a psychological phenomenon (albeit a mystical psychological phenomenon) since this "recognition" has to do with the psychological process of identity. Moreover, it is a cognition, and specifically in this context a *liberating* cognition.

Abhinavagupta is the most prominent and with the greatest impact on our current understanding of tantric yoga. The main contrast of Abhinavagupta's tantric yoga to Patanjali's yoga is the prominence of intellectual knowledge (*tarka*) in Abhinavagupta's system, a feature of the six-fold yoga that is absent from the *Yoga Sutra*. For

Abhinavagupta, the "recognition" or insight is a special kind of intellectual process called *tarka* (Muller-Ortega, 1989). Abhinavagupta's definition of "intellectual knowledge" differs from usual connotations of intellectualism, as Muller-Ortega points out, because the state of *tarka* embraces both transcendent mysticism and an "illuminated" intellectuality. The intellectual nature of such an insight becomes clarified by the feeling of oneness, and it is from this perspective that the subjects and objects are recognized as of the same consciousness. Thus the particular feeling associated with the recognition (or intellectual state *tarka*) is what marks this state as special. It is not purely rational. As mentioned above, Chapple (1994) argues that the *Yoga Sutra* (3.53) transmits the belief that yoga brings about realization of the sameness between two objects, and that those two things are *prakrti* and *purusa*, or matter (such as the matter that forms the body) and consciousness. The tantric text *Malinivijayottara* (MVT) echoes the *Yoga Sutra's* assertion that the practice of yoga leads to a realization of the identity between two objects (Rastogi, 1992). Abhinavagupta also spends time integrating this state of mind (*tarka*) into an understanding of an active mind and the senses. One might suggest that such a realization characterizes the nature of yogic *samadhi* in tantra as well.

In this view, even though we have been focusing on the psychological state, cosmology is central to ritual practice (Flood, 2006). Muller Ortega (1989) points out that Abhinavagupta's insistence that in the journey of mystical yogic praxis this state (*tarka*) i.e., the lived experience of liberation, is the goal of yoga is based on a bias towards the Samkhyan emanationist doctrine that leads to the hierarchical tantric view of reality. Alper (1979) clarifies this position in his argument for a process (understood as oscillation) understanding of god as consciousness or illumination (*prakasa*): he sees

consciousness as the process of coming into existence in the world in manifest form. This view is often identified in primary and secondary tantric literature as oscillation (*spanda*). In this tantric view, there is a "continuous cosmogony" in which the purpose of yoga is not just the immersion, but the return in a state of heightened awareness as well (Muller-Ortega, 1992). The result is that consciousness oscillates between pure and manifest states. Thus expansion is also a major theme. Whereas Classical Yoga was all about withdrawal, the ritual practice of tantric yoga adds the phase of expanding consciousness during both meditative practice and "wake" states, though transformed, as well. Thus, in this view of *samadhi*, the psychological and cosmological processes merge within the practitioner.

This view establishes the philosophical basis of Abhinavagupta's and others' recognition school. The *Pratyabhijna* (recognition) school represents the highest point of philosophical self-awareness reached by nondualistic Kashmir Saivism (Torella, 1992). We have discussed this Kashmir Shavite perspective because these processes of tantric yoga's state of *tarka* – that is, oscillation and recognition of oneness - seem discernible in Anandamurti's *ishvara pranidhana* process of *samadhi* and are therefore examined more closely in the next chapter.

Siddha and Hathayoga: Alchemical Transmutation of the Body as a Path to God-Realization.

White (1996) explains that the widespread (but not complete) death of tantrism was brought about because of a sea change in tantric theory and practice. Through Abhinavagupta, tantrism had become transformed into an elite mystic path, "too complicated, refined, and cerebralized for common people to grasp" (White, 1996, p. 7).

Instead, the worldly powers offered by the tantric yoga sect of the Siddha Yogis (meaning "perfected being") became more appealing. The Siddha yogins originated out of "earlier and more heterodox Saiva orders, … [including the] Pasupatas in particular" (White, 1996, p. 7) and flowered in twenth- through thirteenth-centuries (p. 2) even though Siddha traditions were "more ancient than those of tantrism itself" (p. 2) (i.e., before the sixth-century C.E. (p. 1)). White (1996) explains that in addition to worldly powers (*siddhis*), sometimes considered "magical," Siddha practice also aimed for bodily immortality (*jivanmukta*). White (1996) further describes this tradition as identified with a particular body of practice – including hath yoga - and indicates that it forms a visible part of the Indian religious landscape today. Their most important innovation was their "concrete and coherent method" for attainment of status through tantric, yogic, and alchemical practice.

The Nath Siddha tantric purification ritual of *bhutasuddhi* conjoins practices of alchemy, *hatha yoga*, and tantric ritual (White, 1996, p. 335). In this practice, yogins recite mantras while visualizing the dissolution of the body down to the *chakric* elements of the *tattva*s. Each *tattva* successively dissolves, starting from the most manifest *tattva* in the base of the spine and moving upwards. Because of this emphasis on the *tattvic* structure of the person, the Siddha alchemical method of *bhutasuddhi* relates greatly to the tantric version of Samkhya emanation theory. Building on this perspective, the psychological functions associated with the *chakric* centers tied to each *tattva* are believed by some to simultaneously transform as its *tattvic* element dissolves. Thus this practice is believed to have a purifying effect on the body and mind, and cultivates a state conducive to experiencing *samadhi* consciousness. In this way, *bhutasuddhi* furthers the

purification theme and the Pasupatas' claim that the function of mantra is to purify the mind (White, 1996). White (1996, p. 6) asserts that Natha Siddhs continue to be revered today as India's masters of yoga.

Similarly, physical practices of *hatha yoga* were elaborated in the Siddha tradition that were also believed to purify the body (and mind, too) (White, 1996). In *hatha* practices, raising the *kundalini* is thought to prepare the body for spiritual, perhaps mystical, experience. These practices build on yogic metaphors for the mastery of the forces that sleep in the lower part of the body, forces that, when awakened, transform the yogin's body completely (White). We can draw from these practices to understand Anandamurti's *ishvara pranidhana* since his method of *ishvara pranidhana* includes a few select elements of *hatha yoga*. *Hatha yoga* grew from this tradition, expanding or elaborating on two of Patanjali's ashtanga yoga angas: *prana*yama and asana. As we will see, the *hatha yoga* stream of the Siddhas came to have an extremely influential role in the development of modern yoga practice.

Both these specializations of siddha practice – *bhutasuddhi* and hatha yoga (yoga postures, breathing practices, and other physical practices) - are identifiable in the yoga system of Andandamurti, with only the meditation postures along with the *bhutasuddhi* as part of the full *ishvara pranidhana* meditation practice (the *hatha yoga* practices of numerous postures and breathing practices are not part of the actual *ishvara pranidhana* meditation, though they are part of the wider yoga system).

We have been talking about *samadhi* throughout this section on tantra; in some important sense it seems that these techniques or approaches to practicing yoga (*bhutasuddhi* and *hatha yoga*) help explicate *samadhi* because these techniques lead to an

embodied consciousness. However, it seems that they relate on a more basic level to fostering a concentrated mind and *samskaric* transformation as intermediary processes. The combined actions of *bhutasuddhi* visualization and mantra recitation culminate in the concentration and then withdrawal of the mind; in this phase *ishvara pranidhana* then leads to burning *samskaras*. These practices help concentrate the mind in the sense of gathering and withdrawing the projections of the mind from the world, and then focusing the mind in such a way that the mind expands and consciousness permeates oneself.

This tantric view resonates with yogic theory of the layers of the mind, but differs from the Classical Yoga view of mysticism because in this view there is a bidirectional transmutation of spirit and matter. As we will see later, this view of bidirectionality has led to modern interpretations of tantric yoga emanation theory and understanding of evolution because the evolutionary process occurs through a transmutation of matter into spirit and back again. As we will see next, the *hatha yoga* stream of the Siddhas came to have an extremely influential role in the development of modern yoga practice.

In summary, the alchemical process of *bhutasuddhi* occurs within the body - that is, within cosmic elements believed to be at least symbolically located within the meditator's body. Analyzing this view of the Siddha alchemical method of *bhutasuddhi* along with the other streams of tantric practice provides a new lens through which to process and interpret tantric yoga *samadhi*.

Specifically, this analysis of tantric practice and theory takes the classical yoga philosophy and psychological theory, which was a theory of the mind, into the body, and, importantly, also relates these "physiological" processes to cosmological processes. In this chapter, we have revealed the three mental processes that will be the focus of the

comparison in part III (one-pointed attention, memory, and absorption). But now that we have understood the processes of meditation from the emic perspective, the question still remains regarding how we are to understand the mental processes involved in this process given the clashes in worldviews that traditional understandings of yoga have with modern ways of understanding reality scientifically.

Chapter Five

Rethinking Modern Yoga

Modernity has seen an exchange of ideas about cognition and embodiment between India and the West. In particular, the intersection of ideas between traditional Indian yoga and western ways of thinking empirically about the natural world has infiltrated contemporary interpretations of yoga and resulted in the reinterpretation and translation of classical and traditional ideas about yoga (Alter, 2004; De Michelis, 2004). As a result, modern authorizers of yoga have come to problematically theorize yogic phenomenon such as meditation in physical terms of western science. I shall now analyze the problems these translations have created for understanding the mental processes of meditation.

How *Ishvara Pranidhana* fits into the Modern Yoga Framework

Scholars (e.g., De Michelis, 2004; Hardy, 1984) have noted that the eighteenth century marked an important shift in the religious traditions of India: they met modernity. This meeting of Indian traditions with the rationality of scientific, philosophical, and theological ideas and methods that had emerged in the West during the Enlightenment period significantly influenced the content and form of yoga traditions. Thus these changes, De Michelis and Hardy argue, denote a break from classical interpretations of Indian yoga discussed in the previous chapter. Note that De Michelis (2004, p. 37) uses the term "classical" (with a lowercase "c") to mean the pre-18th century context, which encompasses both Classical and Medieval periods as more typically understood. Because

they are defined by date, the terms "classical" and tradition include the period of the ninth- through the fifteenth-centuries in which tantric yoga flourished. My use of the terms classical and traditional follows her usage.

During the Scientific Revolution the Western intellectual and cultural tradition turned away from exclusive interest in transcendent phenomena and towards nature (Olson, 2004). Via means of reductionism, the scientific method of observation, experimentation, reasoning, and elimination of Aristotelian final causes, mechanistic modes of explanation became favored. These changes that have all operated in the past two centuries in the West have also taken root in both Indian and western approaches to yoga. Thus the theories and modes of yogic practice that dominate mainstream yoga today in its global context forms what De Michelis (2004) and others (e.g., Alter, 2004) have begun to talk about as "Modern Yoga." This concept of yoga contrasts in important ways with traditional understandings of yoga discussed in the previous chapter.

De Michelis (2004) describes four developmental trends that have all been shaped by Western influenced Neo-Hindu thought, the first of which, in her view, leads to the other three. These four typologies together aim to characterize the scope of yoga as people practice it today, especially in the West. This is a typology which she presents as speculative and a tentative first effort, one which further scholarship by her and others may refine and change based on further intellectual insight and new fieldwork findings. Analyzing Anandamurti's *ishvara pranidhana* within this typology will help further our task of delineating an emic perspective on meditation that we can then compare with etic views.

The first typology or category is Modern Psychosomatic Yoga (MPY), a typology that is shaped directly by Swami Vivekananda's Raja Yoga (1896). The yoga schools that fall into this category are dedicated to mind-body-spirit 'training' because they employ methods that seek to transform both mental and physical processes. The next two typologies emerged out of the first: Modern Postural Yoga (MPY), which focuses on the performance of yoga postures (asanas) and breathing (*prana*yama), and Modern Meditational Yoga (MMY) that relies on techniques of concentration and meditation. Both MPY and MMY stress participation with a classroom or session type framework, and limit themselves to very basic religio-philosophical underpinnings of their practice. In contrast to these, the last typology is Modern Denominational Yoga (MDY) and describes groups that emerged during the 1960's that "retain active links with the cultic milieu from which many of the [Indian] recruits come" (De Michelis, 2004, p. 189).

De Michelis (2004) explains that some modern systems of yoga may overlap into one or more categories. This is especially characteristic of MDY whose groups who draw from the whole range of MPY, MPY, and MMY. This is the case with Anadamurti's *ishvara pranidhana*: it seems to be aligned with all four categories in unique ways. For example, there are aspects of his program of yoga that make it fit in with the Modern Postural Yoga (MPY) typology because Anandamurti prescribes daily asana practice. Thus, like other systems of *hatha yoga*, Anandamurti's system aims for transformation through the body. Anandamurti's system could be criticized, though, or contrasted with other MPY schools for its lack of emphasis in explicit detailed teaching of postures and lack of scheduled time for postural practice during collective sessions. Instead, the focus of the collective practice sessions is on meditation as the central and primary practice.

Thus Anandamurti's system also aligns with the Modern Meditational Yoga (MMY) typology because of Anandamurti's emphasis on concentration and meditation techniques, and because of the emphasis on the importance of participation in weekly collective meditation sessions and quarterly retreats for overall self-development. Anandamurti's system also emphasizes that understanding will come through first hand experience, a general feature of Modern Psychosomatic Yoga (MPY) that extends to both MPY and MMY. This encompassing nature of his yoga system can possibly be explained in that Anandamurti's system of spiritual development is actually a much more comprehensive system of yoga than indicated by my focus on *ishvara pranidhana*.

Anandamurti's system most obviously aligns with De Michaels's category of Modern Denominational Yoga (MDY) because of its central focus on *guru* and Anandamurti's own teachings, recorded discourses, and discourse notes from his disciples. Anandamurti created an organizational structure, Ananda Marga that requires a large commitment on the part of its members, and cultish obsession on the part of some of the members with the *guru*. Thus Ananda Marga has a strong organizational system and requires a lot from its members. Anandamurti asserts that the path he provides for his initiates, while centering on the practice of spiritual meditation, is primarily a path of *Bhakti* Yoga (yoga of devotion). Surrender and devotion to Anandamurti as the *guru* are primary in the practitioner's experience. But the deeper and ultimate significance of *guru* and its role in the meditation practice is that the belief in Anandamurti as the embodied form of *guru* merges with the existence of the formless inner *guru* located within each individual person. These are all features of MDY, thus working within this analytic

framework of De Michelis's (2004) typology I conclude that his system would be best characterized within this category within the typology of Modern Yoga.

However, when considering how to analyze Anandamurti's method of *ishvara pranidhana* against the backdrop of Indian thought and traditional forms of yoga, some additional factors need to be considered. Regardless of the authority of *guru* and the personal practice of practitioners, Anandamurti's writings and his teachings clearly aim to link his spiritual practices of yoga to the lineage of Siva, Tantrism, and the Raja Yoga articulated in Patanjali's *Yoga Sutra*. His writings extensively articulate how the religio-philosophical and psychological underpinnings of these traditions form the basis of the practices. Moreover, even though it falls within the historical time period of Modern Yoga, and has much in common with the MDY category of Modern Yoga, Anandamurti's *ishvara pranidhana* and entire system of self-development does not seem fit wholly within these definitional boundaries.

The precise claim that De Michelis (2004, p. 2) asserts about modern forms of yoga is that "most of the yoga currently practiced and taught in the West, as well as some contemporary Indian yoga falls into this category" of Modern Yoga. Thus she implicitly acknowledges that not all forms of yoga practiced today may be classified in terms of the formal category Modern Yoga. Importantly, though, for our examination of Anandamurti's method of *ishvara pranidhana* meditation, De Michelis (2004, p. 189) also observes that MDY groups (such as Anandamurti's) "have not been instrumental in shaping, defining and elaborating more 'mainstream' forms of Modern Yoga theory and practice, and yoga [the physical practice of asanas] is not their primary concern." These clues about what does and does not fall into the "mainstream" of Modern Yoga theory

and practice should guide our further elucidation of an emic perspective on Anandamurti's method of *ishvara pranidhana* meditation.

"Yogic Science" and the "Science of Yoga"

De Michelis's (2004) typology of four categories can be more simply delineated into two basic streams of modern yoga. One is concerned with the physical practice and the body while the other is concerned with meditation, consciousness, and the mind. Anandamurti's *ishvara pranidhana* aligns with the latter. Alter (2004) calls these two streams the "science of yoga" and "yogic science." These names reflect the fact that the modern discourse of science is central to both streams, but in different ways.

Problematically theorizing yogic phenomena – both experience and its structure, although their conflation is exactly the issue - within the philosophy of materialism has been done especially by translating traditional models of tantric physiology (Alter, 2004). Although these have traditionally been understood as empirical realities known through yogic practice and experience (Flood, 2006), Alter explains that emic efforts have translated this understanding into the language and conceptual system of the body's physiology as understood through the empirical methods of observation and measurement used in the modern sciences.

Emerging scholarship on Modern Yoga suggest that modern authorizers of yoga from both streams problematically theorize the empirical reality of cognition in ways that obfuscate to varying degrees the transcendent goals of practice, that is, in the narrow terms of the physicality of the body (De Michelis, 2004; Alter, 2004; and others). There are two points here. First, modernity has seen a shift from the philosophy of

transcendence to the philosophy of materiality. Second, it is within this context of a changed theoretical landscape that an accompanying conceptual shift has translated the yogic body from the tantric imagery of *chakras* and *nadis* to the physicality of the nerves. Here I will start by illustrating the two streams of emic discourse on yoga today and then analyze the problems with translated modern interpretations of cognitive states experienced through yogic practice.

"Yogic Science"

Emic literature in the genre of yogic science reinterprets traditional theories and practice through the discourse of scientific terminology and concepts. Although yogic science does contend with the body, the main focus is the mind and explication of meditative phenomena. Anandamurti's *ishvara pranidhana* fits most closely within this line of literature because of the focus on spirituality and meditation. The problem with this is that in its attempts to engage the discourse of science, yogic science interprets literally the traditional models of the body that had previously been intended as guides to meditation.

Problematically theorizing yogic phenomena – both experience and its structure, although their conflation is exactly the issue - within the philosophy of materialism has been done especially by translating traditional models of tantric physiology (Alter, 2004), which have traditionally been understood as empirical realities known through yogic practice and experience (Flood, 2006), into the language and conceptual system of the body's physiology as understood through the empirical methods of observation and measurement used in the modern sciences. This is done especially by interpreting the

yogic body in terms of modern discourse about the brain and nervous system. This effort has continued throughout the twentieth century. For example, Alter describes Yogeswarananda's (1997) assertion that there is a direct correlation between the spinal cord and the axial, *sushumna nadi*. Similarly, Swami Satyananda (1984) conceptualizes *kundalini* as electrochemical energy. Yet these conceptual conversions are not clear cut and do not necessarily capture the full meaning of the Indian ideas. Even claims from within the translations themselves are not always coherent. Alter notes that Yogeswarananda contradicts himself by both referring to the *chakras* as sensory motor nerves which pervade the entire body and alternatively declaring that it is a incorrect to identify the *nadi* channels as the spinal cord, giving the reason that these structures are not perceived without special meditation. Anandamurti follows this avenue, as well. For instance, he locates *sahasrara chakra* in the pineal gland. He describes the chakras in terms of nerve complexes and the *vritts* as glands.

Alter (2004) explains that the genre of Orientalist literature is a predecessor to the emic yogic science. Examples of this type of literature include Eliade's (1958) seminal text *Yoga, Immortality, and Freedom* and Avalon's (1917/1974) text on *Kundalini* Tantra. Swami Vivekananda's *Raja Yoga* (1896), a reinterpretation of the *Yoga Sutra*, is the seminal work that catalyzed the Modern Yoga movement. In this text, Vivikananda reinterprets the *Yoga Sutra* using the discourse of science and presents this version of yoga in two related models that he calls the prana model and the samadhi model. De Michelis (2004) argues that these models are the foundation of modern theories of yoga.

From a theoretical psychology perspective, there are big problems with this approach because it results in dualisms: the two realities of the subjective meaningful

dimension of the mind and the objective physical mechanical body. The problem is that it is not clear from emic texts on yogic science how these two dimensions interact within the person and result in such multidimensional experiences as meditative absorption. That this is a problem within emic theories of yoga is not surprising because a number of implications of dualisms operate problematically within the field of psychology today.

The "Science of Yoga"

In a second, related strain of Modern Yoga, we see emic authorizers of yoga turn away from concerns about mysticism, consciousness, and even the mind, and instead focus on the body (Alter, 2004). This "science of yoga" proceeds by implementing the scientific method of experimentation to generate "data" about physical changes in the body that these scientists associate with yogic practice. The main problem with this approach is that it "objectifies" yoga (Alter, 2004, p.65). It interprets what, in traditional interpretations of yoga, is a subjective experience of the mind and consciousness into a quantified change in the physicality of the body.

Alter (2004, 2005) explains that the earliest empirical scientific research attempts to understand yoga were conducted by Indian yogis in the 1920's and 1930's who studied the physiological processes associated with yogic practice. Swami Kuvalayananda and Shri Yogendra are central examples of emic authorizers of yoga who contributed to the stream of the "science of yoga." They both established modern medical clinics in the first half of twentieth century within which they conducted scientific experiments to prove the efficacy of yogic practices. They used science to "anchor" their worldview in yoga. These practitioner-researchers sought to find by way of scientific methods "the precise

points of convergence between gross anatomy and the subtle power manifest in yogic physiology" (Alter, 2004, p. 84). In another example, Udapa (1989) builds on the science of yoga goal of using yoga in the treatment of various physical and mental health problems by specifically investigating various uses of yoga for stress management. He wanted to know exactly how yogic practices decrease a person's sensitivity to environmental stimulation. Alter (2004, p. 66) explains that Udupa exemplifies the emic approach to scientific on yoga because he, too, "was in search of that illusive point of transformation between subtle and gross domains." Udupa's central hypothesis centered on the physical body: he thought that yoga reduces stress by way of controlling the cerebral cortex and the production of neurohormones. Yet he still wrote in terms of both systems, for example, in terms of supplying oxygen to each *chakra* (Udupa, 1989, p. 215). These examples illustrate the way in which the emic science of yoga, almost certainly unknowingly, enacts confusion between two realities.

Alter (2005, pp. 119-120) argues that even though emic scientists worked to "purge yoga practices … of all things esoteric, mystical and magical and establish practice on the basis of pragmatic, rational, scientific principles," the modern emic science of yoga and modern theories about yoga are "intimately linked" to esoteric ideas from tenth and eleventh-century discourse and practice of yoga. Be this as it may, what the term and concept of "yoga" means today throughout the popular culture of mainstream Modern Yoga is the physical practice of asana. De Michelis (2004) emphasizes that the Iyangar method of yoga is probably the most widespread form of yogic today, and it along with many other forms of modern postural yoga, emphasized the body in theory and practice. De Michelis goes so far as to analyze the "healing ritual"

of a modern yoga practice session that is focused on the physical practice of asanas and moving the body. This ritual in bears little resemblance, at least outwardly, to the practices of medieval yoga. However, contained within the practice of *ishvara pranidhana* is a practice called *bhutasuddhi*, a practice that bears the same name as a medieval tanric ritual (White, 1996). The science of yoga seeks to investigate the structures proposed in traditional models as if they embodied the same reality as the gross body of science today. This approach cannot stand.

This emic perspective closely resembles the etic approach of science in many ways because it values the scientific method as a means of obtaining the truth (Alter, 2004). Yet there is a subtle distinction between the emic approach to the science of yoga and the etic approach to studying yogic techniques. This difference hinges on two aspects of the scientific method. First, either the phenomena of interest in the science of yoga is still yoga, that is, something subjective, or it is not clear what is the phenomena of interest, and second the "data" are interpreted from the theories of yoga rather than scientific theories.

Alter (2004) describes the limitations in the early days of the science of yoga in terms of misattribution of yogic concepts as identical with scientific concepts, the failure to operationalize or make significant distinctions, and inappropriate application of scientific methodologies. These limitations led to further research efforts in both India and the West to resolve the methodological problems, but also to broader non empirical questions about the purpose of using science in the study of yogic practices such as meditation.

Alter (2005, p. 39) convincingly shows how "the methods of modern science transform the nature of the [yogic] experience and the kind of truth to which it is linked." In other words, scientific study of meditative phenomena reveals only the effects or material traces of meditative practice, and these are not the whole experience. He argues that this type of pursuit results in the kind of translational mistake whereby, for example, the yogic concept of a mystical cosmic energy or life force known as *prana* is given agency in scientific discourse. Even philosophic concepts and religious tenants, though, he argues, still do not convey the "ineffable" truth that becomes known to a practitioner.

Thus this meeting between these two types of knowing, he believes, results in a confusion between two realities. "Yogic science" and the "science of yoga" differ both in the kind of knowledge they produce and also in the way they "authorize" different conceptions about what Yoga is; that is, the confluence of these two streams of knowledge produces a "hybrid trajectory of knowledge" that is neither objective nor subjective. This sort of convergence of two types of knowing is, he contends, a translational mistake.

However, when critiquing the emic science of yoga, we must also recognize that the theoretical approach of etic science from western science is problematic, too. First, it is more explicitly reductionistic than the emic science of yoga. This approach does not encounter the problems of dualisms that yogic science did that are also faced in the emic science of yoga; this is because it ignores the mind and focuses exclusively on the body. This approach fits into the eliminative materialist trend of what Williams (2001) calls the "biologicalization" of psychology that is a mainstay view in cognitive science. To

understand how this approach is woven into modern theories of yoga, it is necessary to understand some of conceptual changes that have been made in yoga.

Key Translations of Traditional Interpretations of Yoga

Importantly, translations in modern emic theories of yoga reflect many of the wider shifts in the western intellectual tradition throughout the nineteenth- and twentieth-centuries. Here I analyze a few key translations that together brought about modern theories of yoga to see whether these apply to *ishvara pranidhana*. This analysis points to some ways in which these translations of modern yoga theories, which center on the translation of the concept of realization, give rise to some of the same theoretical problems that cognitive science faces today; however, it is not so clear whether *ishvara pranidhana* faces all of these problems because it does not assume all of these translations.

Changing the Intellectual Milieu: East and West

Modern yoga operates along the lines of wanting to ground philosophy, practice, and yogic truth in empirical truths. De Michelis (2004) explains that towards this goal, there have been a number of translation themes that have occurred slowly over time since yoga met modernity that are evident in this genre. These translations occurred within a framework of secularized spiritualism (Alter, 2005). Copeland (1967, p. 200) argues that "secularism," defined broadly as the Western phenomena of emphasizing worldly values, especially achievements of science and technology, with the tendency to "deny, blur, ignore, or depreciate the dimension of the transcendent," began making its way into

Indian culture in the late eighteenth century. Over the next century, the dominant thinking about Vendantic yoga was subtly overhauled by the romantic spiritualism of Roy, Tagor and Sen, all leading figures in the Bengali Renaissance, as they assimilated ideas of western modernity (De Michelis, 2004, chapter two).

Meanwhile in the West, by the early nineteenth century the Victorian crisis of faith that had grown out of increasing tensions between science and religion over the past two centuries led masses of Protestants out of the churches and to seek alternative forms of spirituality (Olson, 2004). One outcome led American Transcendentalists to explore Eastern forms of spirituality including yoga (Bevir, 1994; Dazey, 2005; Singleton, 2007). Singleton (2007) explains that the New Thought Movement revived ancient perennial esoteric wisdom of India, but reworked these ideas so that they fit with the streams of Christianity and scientific thinking that held primary sway over the American mind. These changes secularized the spirituality of yoga in important ways that remain evident today.

Dazey (2005, p. 423) points out that one of the reasons that yoga appealed to Americans was that "yoga resonated with psychological and philosophical strains already present in American culture from as early as 1800." Others (e.g., Jackson, 1975; Bevir, 1994; De Michelis, 2004) have made this and similar points about the philosophical, intellectual, and spiritual leanings of early American interest in meditation and yoga (although, remember that traditionally the word yoga implies meditative practice).

The late nineteenth century brought new challenges to the reigning rationalism that had been growing though out modernity. The scientific revolution had brought a philosophy of positivism earlier in the century that impressed into the discourse of

science a greater interest and precision in generating law-like descriptions about natural phenomena (Soskice, 1985). The parallel movements of phenomenology (Varela, Thompson, and Rosch, 1991) and pragmatism each considered new criteria for truth claims, straying away from empiricism. Functionalism, too, stepped away from the "universal laws" doctrine of positivistic empiricism in its quest for the truth. These "isms," each in their own ways, set the stage for the emergence of a cognitive science in the mid-twentieth century – a science devoted exclusively to the study of the mind. And each influenced to different degrees the discourse of science that has so thoroughly shaped modern theories of yoga.

The "Psychologicalization" of Yoga: Translation of the Realization Concept

The analysis of yogic praxis in chapter four explained that what characterizes absorption during *ishvara pranidhana* is the meditator's *realization* or cognition that he or she exists, at least in some dimension, in the same essence as *ishvara* (god). Alternatively expressed, the meditator has the realization that some facet of ultimate reality is present within one's own individual self. De Michelis (2004) suggests that translational shifts of this realization concept from classical Hinduism or Vedanta into Modern Yoga are at the heart of modern yoga theories the "psychologicalization" of yoga. Central to realization is yoga's goal of spiritual knowledge: by the act of meditating, an individual aims to gain knowledge about the true nature of one's own self. Gaining such insight constitutes the spiritual realization and marks success in meditation. As we have seen, traditional classical and tantric yogic explanations of this realization frame it as a mystical phenomenon. As discussed above, the yogic method of *ishvara*

pranidhana is a theistic practice that focuses the mind on the single entity of *ishvara* (god), and the mystical nature of the phenomenon is that the realization is had only by the "grace" of god (Eliade, 1958).

Translating or "psychologizing" this god-talk from both these traditional streams has involved a number of interrelated conceptual changes (De Michelis, 2004) that all result in realization being a cognitive rather than mystical event, from a rationalized scientific perspective. Here I focus on four changes drawn from De Michelis's discussion of the history of modern yoga and also supported by the work of other authors (e.g., Copeland, 1967; Alter, 2004; Singleton, 2007). Of greatest importance for my analysis of *ishvara pranidhana* are Vivekananda's emphasis on an experiential epistemology and his translation of the concept of *purusa*, which both led to Vivekananda's claim that yoga is scientific. Thus, these key translations paved the way for yoga's translation into the discourse of science.

Brahman as an Experiential Reality.

De Michelis (2004) explains how the chain of translational shifts starting from Roy and moving through Tagore and Sen, and culminating in Vivekanada's translation of *purusa* into "mind," all worked to bring the idea of Brahman into modernity as an experiential reality. In this new and translated view of yoga, Brahman became an aspect of reality to be known through direct experience rather than from knowledge gained by belief in textual authority, as was the case in pre-modern Vedanta. De Michelis (2004, p. 81) explains that Sen was the first to introduce into Neo-Vedanta the idea that there is a "diffuse but personally accessible dimension of the divine" and that there is "a direct point of access to the metaphysical [i.e., this dimension] in each individual's psyche."

This point of access is the focus of concentrated attention during *ishvara pranidhana*, and helps explain variations between individual experiences during meditation. Moreover, it also seems in line with traditional forms of tantra, which recognize the experiential reality as more authoritative over textual sources. De Michelis (2004, p. 83) goes on to point out that this "transcendentalism-inspired concept of individual experiential revelation [has become] defined psychologically as 'a state of mind'." In this sense, we can study the state of mind scientifically. De Michelis concludes that this shift of authority from an external to an individually validated source is at the core of the "scientific religion" (of Sen) and the empirical or "scientifically worked out" method to access such an experience. However, this method constitutes a different way of knowing from those ways that are externally and socially validated; thus, at least two distinct perspectives bear on the same phenomenon. The emphasis on an experiential epistemology that is prominent for Vivekananda is also evident in Anandamurti's writings and teachings such that each person is instructed to aim for their own *samadhi* experience.

The reworking of the recognition of Brahman into terms of a "state of mind" illustrates what Singleton (2007) argues is part of the shift to fit the doctrine of divinized self-hood and cosmic healing. In this new (or translated) experiential plane, the abstract ultimate reality Brahman has been translated into a field whereby the self, by the act of relating to the cosmos, becomes divinized. This divinized state is healing by nature; it alleviates suffering. Recall from the previous discussion of the mechanisms of liberative *samskara*, the second mental process of meditation (explained in Patanjali's *Yoga Sutra*), that alleviating suffering, which involves removing the *kleshas* (afflictions) of the mind and establishing a*klista* (non-painful mental processes), is a claimed effect of yoga. In

light of this view, we might better understand the state of absorption (*samadhi*) in the following way. One might agree to believe that *samadhi* helps explain meditation if we interpret "healing" in the sense that the act of entering *samadhi* actually divinizes the self during *ishvara pranidhana* and in this process relieves the meditator of the mental afflictions (*kleshas*).

Pursusa Translated into Mind.

Swamin Vivekananda translated the yogic concept of *purusa*, what was a cosmic level entity, into mind, an entity at the level of the individual (De Michelis, 2004). De Michelis explains that Vivekananda's *samadhi* model follows the Samkhya-Yoga cosmological process of *purusa* mysteriously influencing worldly manifestations, but only to a point. She argues that "most of the time" Vivekananda reinterprets the classical concept of *purusa* in psychological terms. Thus, she cleverly makes the case that in this turn-of-the-century understanding of yoga that is still predominant in yoga today, *purusa* "is both the deepest ontological core of human beings *and* the ultimate spiritual source vivifying and pervading the whole of the cosmos" (De Michelis, 2004, emphasis hers, p. 169). This view also seems closer to the non dualist view of tantric yoga's continuous cosmogony (Muller-Ortega, 1992). This translational move parallels similar philosophical and theological shifts during that time of removing final causality and a metaphysical reality (Olson, 2004). In this way, yoga can be understood from the perspective of rationalistic science.

Vivekananda's translation of *purusa* into mind poses a problem for understanding *ishvara pranidhana*, however, because without a distinct concept of *purusa*, *ishvara pranidhana* meditation simply does not make sense in its goal of god-realization. The

recognition of the reality of *purusa* is necessary for *ishvara pranidhana* because this is the reality that a meditator must come into contact with in order to experience the deeper states of absorption or *samadhi*. The goal of *ishvara pranidhana* is to establish oneself in *ishvara*; if there is no *purusa*, then, since *ishvara* is a type of *purusa*, there is no *ishvara*.

Somewhat different from this translated interpretation, Anandamurti, like traditional tantra, maintains a distinction between the traditional concepts of *atman* and *purusa*, with the concept of *atman* constituting the ontological human core referred to by De Michelis, thus maintaining the cosmological status of *purusa* in full. This view is conceptually similar to traditional tantra even though the categories of *atman* (an individual yogin) and *purusa* (or Siva) are differently named. What is realized during the state of *samadhi* from this perspective is the fundamental identity between the individual person and the cosmic entity. Like Vivekananda, too, Anandamurti also employs the idea of attunement or resonance. For Anandamurti, attuning or resonating one's individual "vibration" (or self) to that of parama *purusa* is widely taught as part of the goal of *ishvara pranidhana*: one must break through the bonds of the mind to get through to – or resonate with - *atman*, Self, parama *purusa*, or Siva. It seems that perhaps Vivekananda's and Anandamurti's two descriptions result in the same phenomenological event, i.e., realization of this essential oneness between self and cosmos at the core level, despite conceptual differences.

Liberation into Evolution.

One of the key steps in this translational process was Tagore's "exposition" of human teleology that resulted in an "evolutionary spirituality" (De Michelis, 2004, pp. 59-60). De Michelis explains that in this view, the soul becomes "infinitely progressing"

and "overcoming" on its spiritual journey to cast off its animal nature and reach sacred spheres where it can attain infinitely higher states of love, wisdom, and virtue and thus overcome sin and sorrow. These translations reflect an affinity for the evolutionary idea of adaptation. However, unlike the modern secular theory of evolution, De Michelis explains that in Tagore's view the journey of spiritual evolution occurs through the grace of god rather than only via mechanical forces. Because of this strong theistic foundation, she concludes that this evolutionary spirituality still maintains some coherence with classical Hinduism.

Anandamurti uses the notion of spiritual progress, too, as we saw earlier, asserting that god is an attractive force such that it pulls the mind toward itself (i.e., a centripetal force). Progress here is defined in terms of moving closer to god. Because this view is theistic, like Tagore's view, and spiritual progress is caused by the grace of god, then according to De Michelis's reasoning, this view also maintains coherence with classical Hinduism. This perspective informs how we understand the mental processes of *ishvara pranidhana*. Thus, concentrating on god, burning *samskaras* as a result of attraction to god, and the mind merging with god in *samadhi* all appear coherent with classical Hindu perspectives on this issue.

De Michelis (2004) shows that later after Tagore, however, the evolution theme was carried even further through occultist secular and mechanistic influences such as those by Sen and Viveknanada such that these ties to classical Hinduism were lessened. She explains that in the second half of the nineteenth century the "science of religion" became relevant and Sen and then Vivekananda believed that the Indian tradition of yoga held the key to the science of religion. De Michelis (2004, p. 64) quotes Kopf (1967, p.

67) who asserts that what was meant by a science of religion was "the discovery of natural laws about religion" and the modern study of evolutionary ideas played an important part in this process. She elaborates that to accomplish this goal, as the basis for the other translations of the realization discussed above, Vivekananda applied the basic approach of contemporary physics to Samkhya-Yoga cosmology, and built on this method to explain *samadhi* and other aspects of yoga. Thus, he translated the Samkhya-Yoga concepts of *prana* and *akasa* into energy and matter, respectively, both linguistically and also in some way conceptually, and affirms "that they interact on the basis of recurring and knowable "natural laws" (De Michelis, 2004, p. 157). De Michelis stresses that this is as scientific as Vivekananda's model gets, arguing that after that, his theorizing becomes natural philosophy rather than science. This is his *Naturphilosophie* focused on the agency of the *gunas* (binding forces), a seemingly impossible yogic concept to articulate in the discourse of science.

This last shift of realization into a secular and mechanized framework means that traditional concepts must be even further translated to fit into the modern view. For example, burning *samskara*, an aspect of the second mental process of meditation, must be translated into an efficient cause-effect framework, rather than existing in its traditional paradigm of being linked to final causality in which a theistic meditation makes sense. Recall, though, that the volitional activity of *samskara* is related to the intentional nature of action. One of the major obstacles to reconcile from these translational shifts, then, is that adaptation within the rational scientific theory of evolution is not purposeful while spiritual practice including *ishvara pranidhana* is, and this type of dilemma has yet to be solved.

Translation of Magico-Religious Beliefs about Mantra

As we have seen, in the cultural milieu of Enlightenment rationalism and the empirical standards of science, a range of yogic beliefs and practices could not be held tenable, and a foremost example among these was the magico-religious beliefs and practices involving Indian *mantra* (Alper, 1989). In the traditional tantric yoga explanation, the function of *mantras* was explained through the ritual framework of the Hindu tradition and it is this framework that gives mantra its meaning (Singleton, 2007). In this framework, Singleton explains, "magic" was embodied in the *gunas* (binding forces of reality) and the mystical physiology of the yogic subtle body. As described in the tantra section above, mantric utterance during ritual practice is traditionally thought to activate aspects of the mystical physiology, most importantly the latent or "sleeping" *kundalini sakti* (spiritual energy), and in this way catalyze transcendent states of consciousness. However, modern translations of the ritual function of mantra moved away from belief that an "irrational" sound could have a meaningful impact and effect on the mind and person. Significantly, Urban notes that omissions were conscious for political capital to appeal to modern scientific minds.

In contrast to a traditional tantric view, in the rationalistic culture of modernity mantras were seen as "bizarre and unintelligible phonemes" – they were not considered to be rational language; therefore, emphasis turned to the meaning evoked during mantric utterance and the mantric sounds were replaced with words that carried understandable meaning to the hearer (Singleton, 2007). Singleton explains that this translation of practice from using sanctified mantras to using any word as if it were a mantra was highly influenced by the use of autosuggestion and affirmations as means to spiritualize -

and ultimately "heal" - the body. This notion of healing differs markedly from the yogic notion of healing due to divinization, since in divinization there is actual contact with a spiritual entity whereas spiritualizing oneself through affirmation connotes a feeling state but not necessarily contact with another source. Emphasis in the late nineteenth-century on the meaning rather than the sounds reflected the trend of James's functionalist prevalence over ritualism and the overall shift towards a framework of secularized spiritualism (Singleton, 2007). Thus, the concept of mantras became "psychologicalized" along with other aspects of yoga.

On this point, then, the use of mantra during *ishvara pranidhana* does not resemble modern translations of its practice and function(s) because Anandamurti adopts a tantric mystical explanation of the function of mantra in terms of the mantric phoneme as a part of the body, rather than the modernized view of a psychologicalized function. However, as indicated above, this perspective is viewed as mystical rather than magical.

Urban (2003) highlights the observation that one of the ways in which modern translations occurred was apparently through conscious omissions of tantric teaching by modern authors. Above we saw evidence of translations of traditional yoga authored by Vivekananda. Urban (p. 135) extends this claim by specifically arguing that Vivekananda consciously "sought to cover over and deny" the tantric teachings of his master Swami Ramakrishna, suggesting that Vivekananda censored tantra for a political agenda of constructing a new national identity within the socio-historical context of a colonized India embedded in modernity. Lidke (2005, p. 154, note 40) asserts that Ramakrishna was "heavily influenced" by Sakta Tantra. Urban suggests that Vivekananda distanced himself from the often "embarrassing" teachings of the tantras embodied in his

"enigmatic Sakta mystic" teacher. This distance is significant because Ramakrishna is considered to be the primary spiritual teacher of Vivekananda, but De Michelis says that Vivekananda drew more from the neo-Vedanta Brahmo-Samaj than Ramakrisna's teachings and tradition.

This socio-political insight is interesting for my analysis on translations of modern yoga because it seems that there might be more similarity between Anadamurti and Ramakrishna than Vivekananda and Ramakrishna in terms of their similar identifications with tantrism. The implication is that the modernization of yoga could have taken a trajectory that has less affected tantric yoga than Vedanta-like yoga.

In parallel to this, Urban (2003) goes on to argue that although Woodruff (the author of a number of translated books on tantra that are popular in the West who went by the pen-name Avalon because he did not want his real name to be associated with the "embarrassing" subject matter of tantra) defended tantra, he also "censored" and "covered up the more scandalous and even immoral aspects of tantra." In particular, Urban (p. 141) argues that "Woodruff's interpretations involve an odd mixture of Western scientific terms" – such as evolution, matter, energy, etc. – and Sanskrit philosophy and language.

Within this new translated framework, Western followers could try to undo dogmatic or "magical" beliefs and oppressive external authority, and see religion as a cultural system within which to obtain grounding in rationalism and science (De Michelis, 2004). This new frameworks fits within the overarching goal of synthesizing science and religion by de-emphasizing "magical" aspects of tantric practice such as mantra, authority aspects of tantric practice such as *guru*, and metaphysical "truth" ideals

that cannot be explained by rational science such as mystical experience in meditation. De Michelis suggests that this all contributed to the eventual trend towards physical practice and emergence of scientific experimentation investigating yoga, which was by this time seen more as a physical practice (i.e., the performance of *asanas*) rather than the traditional understanding of yogic practice as meditation.

Reconsidering *Ishvara Pranidhana*

Anandamurti's discourse on *ishvara pranidhana* falls into the stream of yogic science because even when he talks about the body, he does so with a focus on spirituality and mysticism, and explicates the occult. While he does value *asanas* and the body, his central practice and philosophy concerns meditation.

So far in part II, we have seen that modern reworkings of yoga came from a scientific mindset often within emic practitioners, and that this has been important for "rationalizing" yoga and shifting explanations away from its traditions. At this point one might now question exactly what is yogic science and the science of yoga really. And also ask how much of all this translation applies to the contemporary tantric yoga meditation practice of *ishvara pranidhana*. The answers to these questions form the emic perspective on *ishvara pranidhana* that we have been seeking.

We have seen that there are identifiable strains of traditional interpretations of yoga, especially Classical Yoga and tantric yoga, in Anandamurti's method of *ishvara pranidhana*. First and foremost, we have seen that concentration on *ishvara* as a concept or theorized reality and *ishvara pranidhana* as a practice technique are visible in the Classical Yoga text, the *Yoga Sutra*. We have also seen that the process of use of mantra

is a defining feature of Anandamurti's method of *ishvara pranidhana*, especially as articulated through certain tantric Saivite schools and their non-dual theories of the emanation of worldly objects from consciousness. Thus the tantric Siddha practice of *bhutasuddhi* that is also visible in *ishvara pranidhana* stems from such a cosmological perspective. These aspects of classical and traditional yoga are all visible in Anandamurti's *ishvara pranidhana*.

But in addition, some of the translations that have occurred to generate Modern Yoga also apply, and help to locate Anandamurti's *ishvara pranidhana* within the contemporary yoga milieu. Thus, while the emic framework of *ishvara pranidhana* holds mysticism and mystical accounts of absorption as central to explanations of meditation, at the same time it adopts the framework of health and disease, and, I argue, continues the classical "liberation from suffering" theme in modern language. Although *ishvara pranidhana* still holds onto the concept of *purusa* (instead of becoming translated into mind), this realm is brought, like Brahman (ultimate reality), into view as an experiential reality. Like the rest of Modern Yoga, *ishvara pranidhana* advances notions of divinized self-hood as a result of practice, as well as the possibility for cosmic healing. Finally, although purposeful spiritual liberation from embodied suffering is still the goal of *ishvara pranidhana*, this goal is put into an evolutionary context like other streams of yoga practiced today, although the details may not yet be fully coherent. Thus in important ways, the emic model of *ishvara pranidhana* represents a mix of both traditional and modern practice methods and interpretations. This is the model that we will carry into a comparison with the etic model of the meditating brain.

In part III, we will no longer deal with socio-historical and cultural movements. Having set out these two perspectives, we will instead move on to comparing the same and similar concepts of mental processes at various analytical levels with the goal of understanding how they contribute to this very interesting phenomenon of meditative absorption. We have seen that some of the same or similar concepts seem to be interrelated, and now we will see if we can draw out the similarities and differences and clarify any existing confusions about the types of knowledge each perspective contributes. Thus we will engage in a somewhat more detailed examination of these concepts as a way of drawing them together. But before we turn to these questions, let us conclude part II with a discussion that brings into focus our central problem of comparing emic and etic models of meditation.

The Central Problem of Reference and Reality Depiction

What we have before us today in the field where science and yoga intersect one another, is two competing views of reality. On the one hand, scientists are interested in what happens in the brain during meditative states. On the other hand, practitioners seek to raise their own *kundalini* so as to encounter for themselves a transcendent state. Looking at these two characterizations of meditation, it is evident that scientists use their data and theories to describe what we can known about the physical architecture, while practitioners use the "data" from their own perceptions and experience along with culturally passed theories to describe experiential realities. The central problem that occurs when these two depictions come into contact is that there is a question as to the reference depicted by each model. As we have seen throughout this chapter, further

problems ensue when one attempts to use the discourse of science to characterize a transcendent state. Is it possible, then, for people talking from each perspective to be talking about the same thing, the same state or condition? What sort of authentic dialogue is possible?

Alter (2004, p. 64) argues that metaphors function in the science of yoga to bring these realities into proximity with one another (i.e., science enables a metonymic understanding of mind, body, and transcendence). He explains, "Science enables a metonymic understanding of what might otherwise be read as an elaborate analogy. It forces the question of empirical correspondence [which might otherwise be seen as an elaborate analogy] into the domain of metaphor, producing multiple level of mimesis within and across the divide between epistemology and ontology." Alter is saying that science allows for a certain kind of understanding that forces the question of empirical correspondence between subjective truth and physicality into the domain of metaphor, and that this produces multiple levels of representing or reflecting nature or reality.

Soskice (1985) also argues that metaphor help us understand something we do not understand, in both science and religion. The problem of reality depiction occurs when the referent of the reality depicted is not literal. This is the case of our emic perspective, and our etic perspective, too. Emic perspective the referent of samadhi or "That" as indicated by the mantra AHUM "I am that" (Muller-Ortega, 1989) is not at all clear. In neuroscience, he referent "brain" is literal, as is biochemical activity; however, there is also the machine model that depicts the mind, which underlies the science of the mind. It is difficult to describe these realities because they take us into unfamiliar and unknown territory.

Soskice (1985) compares the models in science and religion on the question of how they are used as a way to get beyond superficial comparisons. She compares on two points, but I discuss only the first one here, and that is the (false) belief that the models of science are explanatory and those of religious affective. Instead, Soskice argues that there is a cognitive function for the use of metaphor in religion. This cognitive approach to metaphor takes the place of using the narrative unit as a 'language' or speech event (p. 109). In this view, imagery and structures of theistic reflection (i.e., religious models) are to be understood as reality depicting. In the chapters that follow, we will assume this cognitive stance on the use of metaphor in both science and religion. Because from this point of view one cannot cling to a realist position, this will be our starting point from which to inquire wider problems of the nature of explanation.

In light of these modern puzzles, this type of inevitable flowing together of ideas about the same phenomenon of meditation requires further analytical consideration, but with a different kind of translational focus. Rather than trying to overlay a "scientific" interpretation onto the yogic model, I will compare each system on its own terms with the other. Whereas "yogic science" of *ishvara pranidhana* has the purposeful goal of liberation and alleviation of suffering, the science of yoga has the pragmatic goal of knowledge of the body. This difference motivates a comparison of how each views the mental processes of meditation in an effort to clarify existing and potential confusions resulting from the intermingling of these two ways of knowing meditative absorption.

Specifically, in part three we will compare the three tantric yoga processes of concentrated mind, *samskara*, and *samadhi* examined in this chapter with three seemingly similar categories determined by my analysis of the latest neuroscience and

physiological research literature on meditation from chapter three, namely attention, memory, and emotion. Admittedly, scientific study of meditation has so demystified and translated meditation into concepts and processes of health and disease, stress, etc., that comparison of the processes that so dominate current cognitive psychology and cognitive neuroscience with the three central cognitive processes from the emic meditation perspective of tantric yoga may prove to be quite difficult. Perhaps the concept of mysticism, and the way that each of these three mental processes (especially the last one of *samadhi*) ties in to mystical phenomena, is the most difficult aspect to understand about tantric yoga. But mysticism is still out there, although it is not in the new (and now dominant) matrix – that is, this is not just a historical concept from medieval tantra or older yogic eras but rather a living phenomenon that is written about and talked about, and possibly even experienced by contemporary practitioners. Therefore, we will revisit this notion of mysticism in part III even though it does not exactly fit in with the modern scientific paradigm because mysticism is central to tantric yoga.

Part III

Chapter Six

Concentrated Attention

A number of neuroscience studies have shown that meditation impacts neurophysiological processes of attention (Valentine and Sweet, 1999; Slagter, et al., 2007; Tang, et al., 2007; Lutz, Slagter, Dunne, and Richardson, 2008). Many of the executive functions that involve attention are relevant to meditation, such as attentional shifting, working memory, focusing, and cognitive flexibility (Levine, 2000; Lutz, Slagter, Dunne, and Davidson, 2008). Similarly, Yoga recognizes one-pointed attention (*ekagrata*) as fundamental to meditation and attainment of absorption (YS 3.2, 3.11.3.12; Miller, 1995). A number of techniques or strategies are given in traditional yogic texts aimed to help practitioners focus and concentrate attention as a necessary phase of the meditation process, and *ishvara pranidhana* is one such technique (YS 2.32, 2.45; Miller). In this method, practitioners concentrate all of their attentional resources, including all of the sensory apparatuses, on *ishvara* (god). Thus, the task in this chapter is to compare the neuroscience and tantric yoga perspectives on the processes of attentional focus.

1. Types of Attention

I begin this comparison with a consideration of how the two systems conceptualize attention. This comparison shows that the two systems conceptualize attention in largely similar ways, according to the "types" of attention that manifest in different moments. However, although the two systems come to almost the same

conclusion about the kinds of attention the mind can "enact" (Varela, Thompson, and Rosch, 1991, p. 173 and chapter three), or perform, there is one "type" of attention articulated in the emic literature that is not well formed in the neuroscience literature on attention: *nirodha* (cessation) or quieted attention. According to Yoga, this type of attention is specific to meditative states of consciousness. Neuroscientific research on meditation addresses this question of conceptualizing meditative attention, but such conceptualizations of attention are not recognized in the field of attention more generally. In this section I focus the comparison on explicating this type of attention and highlighting what it means in terms of self and environmental contexts. Then, in the following two sections on mechanisms of attention, I extend the analysis to consider more fully the similarities and differences between the two perspectives' conceptualizations of meditative attention.

Tantric Yoga: One-pointed and Quiet as Types of Attention during Meditation

In his commentary on the Yoga Sutra 1.1, Vyasa defines the following five types or stages of attention: (1) *ksipta* (wandering), (2) *mudha* (forgetful), (3) *vikshepa* (distracted), (4) *ekagrata* (one-pointed), and (5) *nirodha* (cessation) (Prasada, 1912). The first three of these types of attention (i.e., wandering, forgetful, and distracted) are types of attention active during normal mental states of consciousness and are the kinds of attention that draw the mind outwards, while the last two, *ekagrata* and *nirodha*, are the types of attention important for meditation (Eliade, 1958).

Prasada writes that *vikshepa* (tossing) is a state in which attention is occasionally steady or distracted. In this state, one is able to attain some concentration but there is no

ability to sustain attention. This state is marked in contrast to a state in which concentration is sustained and "one-pointed" (*ekagrata*). *Ekagrata*, one-pointed or concentrated attention, is the foundation for absorption in yogic meditation. Swami Yogabhakti (1990) characterizes *ekagrata* as "the attentive mind," and he calls this state the "finest aspect" of *dharana* (or concentration). One practices concentration (*dharana*) to attain the one-pointed type of attention. Thus, *ekagrata* (one-pointed concentration) is the type of attention that is necessary to shift the mind into meditative states, and this type of attention leads to *nirodha* (cessation of mental function), the type of attention that characterizes the goal state of meditation.

Patanjali's *Yoga Sutra* YS 1.32 asserts that "concentration on one principle" (Swami Satyananda, 1976) or focusing on "the single truth" is the means to prevent distractions (Miller, 1995). Similarly, YS 3.2 defines meditation (*dhyana*) as "focusing on a single conceptual flow." Miller elaborates that meditation involves "unwavering attention" and "a continuous flow of attention." YS 2.1 identifies *ishvara pranidhana* as one of the main methods to achieve this type of attention and we have seen that the method of using mantra during *ishvara pranidhana* serves as this single point of concentration. By practicing this technique, one may develop *ekagrata* or one-pointed concentration.

The last type of attention, *nirodha,* is the meditation process in which all thoughts and all the *klesha*s (mental afflictions) become absorbed into or return to their origin, that is, the object of thought (see Miller, 1995, YS 1.41-46) (see also YS 2.10). When the meditator sustains attention to the objects representing god during *ishvara pranidhana* meditation, integration occurs and one attains a state of *nirodha*; in this attentional state

the meditator may enter deeper and deeper levels of absorption (Feuerstein, 1979) or *samadhi* (Chapple, 1982).

Finally, *ekagrata* can be a complex form of concentrated attention in which the meditator is paying attention to multiple things at once. During *ishvara pranidhana*, for example, the meditator attends to a particular posture, the breath, and to a complex visualization all while reciting the mantra. In this sense, concentrated attention during meditation is a matter of expanding awareness to multiple aspects of the single task, with the task being contemplation of or striving to feel the meaning of the mantra. Sustaining attention to the mantra as the object of meditation relates to the specific belief that oneself is identical at a core level to the whole of existence or reality of *ishvara*. This belief comes from the tantric emanationist theory or cosmology that resonates with the Samkhyan categories of all the elements of reality coming from the same source. Rather than shifting attention from one small task to another (paying attention to each aspect of the meditation one after another), the meditator learns to coordinate attention to all of the objects at once and remain attentive for longer and longer periods, and this coordination is what requires such concentration.

Neuroscience: Selective and Sustained Attention as the Types of Attention during Meditation

The neuroscience literature on attention described a number of different types of attention. The main ones are wandering, divided, selective (or concentrated), and sustained attention. For example, Raichle and colleagues (e.g., Raichle et al., 2001; Gusnard and Raichle, 2001) identify what they call a "default mode" in which attention

diffusely “wanders” when the mind is not engaged in any particular task. In this state, the mind wanders towards internal private thoughts, feelings, and memories (Smallwood, Mc Spadden, and Schooler, 2007). As one aspect of mind-wandering, Mason et al. (2007) recently found evidence that brain areas of the default network (e.g., medial temporal lobe, medial prefrontal cortex, and posterior cingulated cortex) are involved in generating stimulus-independent thought when attention is distracted or tosses from one thought to the next.

Until recently, the concept of mind wandering has been buried within various related lined of research such as stimulus-independent thought, task-unrelated thought, and task unrelated images and thoughts (Smallwood and Schooler, 2006). Smallwood and Schooler (2006) seek to integrate mind wandering into mainstream models of executive attention because it helps explain controlled processing, such as the shifting of executive control. The shift of attention away from sensory sources that occurs in these types of processes was originally described as “decoupling.” When the mind wanders, the content of working memory is “decoupled” from the attentional task, which interrupts retrieval and recollection processes (Smallwood et al., 2007). In this state, attention may become divided between internal and external information when some attention remains on the intended task. Alternatively, research on divided attention suggests that subjects can place attention on multiple objects or ideas at once (Smallwood and Schooler, 2006), the kind of attention required for multitasking. Divided attention will be related to the kind of multitasking necessary for *ishvara pranidhana* in the comparison section, which involves intentionally decoupling all attention from the environmental surroundings. Other forms of internally focused attention include mental imagery, reasoning, and autobiographical

memory recall (Smallwood and Schoolar, 2006) and internally focused attention is also linked to awareness.

When the mind wanders, people are often unaware that their attention has drifted away from the intended object of attention (Giambra, 1995). Awareness or lack of awareness (or attention) to an intended task is also an important aspect of attentional processes because the ability to sustain attention can fluctuate. In the paragraphs below I discuss the ability to sustain attention as conceptualized in attention research. Because this aspect of attention is examined in memory research as well (i.e. the tendency for attention to fluctuate conceptualized in terms of "forgetfulness"), I will discuss it again in the memory chapter. In both sections it must be emphasized how intertwined attentional and memory processes are when it comes to this aspect of conscious experience.

Neuroscience literature on attention defines two further types of attention: selective attention and sustained attention. Both of these types of attention are at the heart of research on attentional processes in meditation. In a recent review article on meditation, Lutz, Slagter, Dunne, and Davidson (2008) characterized these two types of attention as two distinct "styles" of meditation, calling these styles, respectively, focused attention (in which meditators direct their attention to a selected object) and also detect mind wandering from the meditation task), and open monitoring (in which the meditator sustains attention to the content of experience). Both of these types of attention require monitoring skills to detect distraction or wandering of attention away from the task.

The main difference between these two styles of meditation or types of attention is the object of attention. In the case of selective attention (or focused attention) the person attends to a specific object or activity. In the case of sustained attention (or open

monitoring), the object of attention can potentially vary over time. In this case, attention is held or sustained to the single task of observing the mental content, even though this content shifts. As we will see, during *ishvara pranidhana*, selective attention on mantra is required as the sole object of attention during the preliminary purification stages, but the task also requires sustained attention because the process is lengthy and the selective attention shifts to a contemplative act over time.

Comparison: Types of Attention and Concentration

Yogic and neuroscientific perspectives both describe a number of similar types of attention. Both identify the wandering type of attention in which no task captures attention; forgetfulness in which one loses track of the attentional task; distracted or divided attention in which the mind attends intermittently to a task; selective attention in which the mind is wholly focused on some selected target, task, or focal point; and some sort of sustained attention in which the mind attends for some time to that selected task and may become quiet. Both systems indicate that these types of attention are common in everyday life during waking states. The similarities between these types of attention may be obvious with few differences between them.

In particular, the yogic *ksipta* (wandering) seems to be the same concept as the wandering mind discussed in neuroscience literature that has been linked to the default mode of attention. Wandering in both perspectives includes the yogic notion of *vikshepa* (distracted attention) and the neuroscience notion of divided attention; both of these concepts convey a sense of sometimes distracted and sometimes focused attention.

Mind wandering is similar to meditation in that in both processes attention is shifted internally and in these states attention is no longer driven by an external stimulus. However, mind wandering occurs in the absence of explicit intention (Smallwood and Schooler, 2006) and in the case of *ishvara pranidhana*, the mind consciously directs itself away from peripheral stimuli and towards one single abstract idea of the infinite. Therefore, these processes are distinct because when the mind wanders there is little controlled attentional processing, yet in *ishvara pranidhana* meditation, attention is purposefully and intentionally held to the selected object.

Neuroscience research on divided attention suggests that attention actually moves from one thing to another very quickly rather than attention actually being divided across multiple things at the same exact moment (Smallwood and Schooler, 2006), and this notion supports the yogic senses of wandering (*ksipta*) and distracted (*vikshepa*) attention. Note, though, that the idea of attention to multiple objects or events *in the same moment* is more reflective of expanded awareness (Walsh and Shapiro, 2006). Expanded awareness is thought to be an important quality or resultant state of meditation. This sense of attention is not like the yogic wandering or distracted attention or the neuroscience divided attention. Also, forgetfulness that arises from inattention, and can be stress-related, seems to be exactly what is meant by the yoga concept of forgetfulness (*mudha*).

These types of attention that are shifted during meditation – i.e., wandering (*ksipta*), forgetful (*mudha*), and distracted (*vikshepa*) - suggest the yogic sense of dispersiveness. The neuroscientific concept of automatic or exogenous stimulus-driven attention and yogic dispersive attention are similar because both concepts have the idea

that the environment captures attention. The neuroscience concept of controlled or endogenous attention means that the person shifts attention so that it is intentionally focused and brain activity is internally generated rather than being stimulus-driven (Vogels, Rajan, and Abott, 2005). This concept is similar to the yogic notion of introversial attention because, in both, the person controls attention rather than outside stimulus. However, there is a difference between these ideas, too, because implied in the neuroscience notion of controlled attention is that one directs attention towards an "external" stimulus as a means of attaining some goal. In this view, the stimulus is often located out in the worldly environment. In contrast, the yogic introversial attention by definition means that attention is directed towards some "transcendent" reality that embedded in both the self and the environmental context, in which the distinction between self and the world does not exist.

There is little difficulty in recognizing concentrated and sustained types of attention as similar between both yoga and neuroscience. Both systems identify a concentrated mental state akin to absorption, which involves sustained attention to a single field. Eliade (1958) points out that these two types of attention, formulated in yoga as *ekagrata* and *nirohda*, are important for yogic meditation, and Lutz et al. (2008) suggest that in neuroscience research there is a focus on these types of attention in studies of meditation. To achieve the yogic *ekagrata* (or one-pointed concentration) requires that one first attains selected attention to an object or task as described in neuroscience; by definition the neuroscientific concept of selective attention implies concentrated attention. Yet the concentration of yoga intimates some sort of physical process in that the mind is an ontological structure that itself seems to become concentrated, whereas in

neuroscience the notion of concentrated attention intimates a functional process whereby the physical processes that shifted are blood, electricity, and biochemicals. But there are no exclusively "mental" structures. This point will be further explored in the next section on mechanisms.

Despite these great conceptual similarities between types of attention, another main difference is that while neuroscience applies both the attention concepts relevant to meditation to different contexts generally, this is not the case for yoga. While yoga may consider *ekagrata* as a general state of attention, *nirodha* is a very specific type of attention defined only in the context of yoga. The *nirodha* type of attention in which the mind is quiet has meaning only as the goal state of yoga. Nevertheless, this concept as a type of attention has meaning in the neuroscience context, too, in the line of research that examines attentional processes during meditation.

In sum, both systems recognize several types of attention that are conceptually similar and both identify selection and sustained focused attention as requisite for a meditative type of attention. However, this comparison has shown that the concept of *nirodha* (in which states of absorption are entered into) is a type of attention with meaning only in the context of the emic system's broader account of identity. Now I turn comparing the mechanisms of attentional processes unique to yoga and neuroscience with the goal of furthering this exposition on the realities depicted by these competing models of meditation.

2. Mechanisms of Concentrated Mind and Attentional Processes

The analysis now shifts from considerations of conceptualizations of attention to an examination of the mechanical operations of the mind's attentional processes. As we saw in part II, both yogic and neuroscientific accounts assume that the mind is constituted in materiality. This is largely a philosophical question because it addresses the metaphysics of the mind and its reality in the world. However, recent advances in cognitive neuroscience over the past 60 years (Varela, Thompson, and Roasch, 1991, chapter three) have made it possible to examine this question what what scientists consider to be great empirical vigor. Thus, the question of the physical mechanisms of the mind is currently a matter of great debate amongst professional philosophers and cognitive scientists who focus on theoretical and empirical questions of mental phenomena.

Theories matter for what kinds of assumptions we make about material reality, which in turn shapes hypotheses about observable phenomena, especially regarding the kinds of methods practitioners can use to observe those phenomena. What we are comparing here, then, are descriptions about the mechanical operations of attention processes that are derived from the differing methods. On the one hand the emic account comes from practitioners' observations about the mind drawn from the mind observing its own processes, while on the other hand the etic is shaped by scientists observing biochemical and electrical activity in the structures and processes of the brain. These two methods emphasize different aspects of embodied reality. In both systems, practitioners make inferences based on these observations about causality that shape their theories about the mind.

Tantric Yoga: Intentionality as the Self's Mechanism of Concentrating and Focusing the Mind

When in a normal state of mind, people pay attention to worldly events and objects, but in meditation people try to pay attention to their experiential realities by introspecting on their own mental processes. Chapple (1982, p. 113) explains that when one is in the state of *nirodha* and absorption (*samadhi*) arises, "attention cannot be separated from the intended; awareness is both subject-free (*anahamvahi*) and object-free (*nirvastuka*)." He explains that this state of awareness (i.e., absorption) is neither a union of an "appropriating" self with objects of appropriation nor a Cartesian separation of thought and thinker, but rather a non-separation of knower, knowing, and known. In *ishvara pranidhana*, what is intended is that practitioners penetrate their awareness into the essence of their own identity, free from any worldly or mental conditions. Practitioners take on this intention as their own. This intention to concentrate the mind and gain "spiritual" knowledge (gained from entering this state of awareness) operates as the primary process, or what I will call here a "mechanism" that brings the mind to the one-pointed *ekagrata* state of attention, and hence enables absorption. Here we examine intentionality as a mechanism of meditation and the driving force that develops *ekagrata* (one-pointed concentration) and the emergence of absorption.

Yogic techniques require a "restructuring" of the thought from mundane thinking to what Wheelock (1989) calls a *responsible* intention. It matters what new thoughts are put in place to take the place of the old ones. If one's intention is to experience the ordinary objective world, or at least an outward perception of worldly objects and events,

for example, to attend to an object in the kitchen and see a table or to sit in a chair and read a particular book, then one's attention will follow this intention; the attention (or mind) is directed to the intended goal. But if what is "intended" is realization of *ishvara* or ultimate reality, especially within oneself, then thoughts cannot be directed towards the worldly level of objects (Chapple, 1982). What is required from a tantric perspective is to see non-separation in the nature of all worldly objects (Muller-Ortega, 2005). Thus, thoughts are directed beyond the mundane level of normal worldly appearance so that one can perceive what Anandamurti calls a "subterranean" flow. For proper meditation, thoughts must be directed by means of the particular use of mantra towards the intended object or goal (YS 3.2; Feuerstein, 1979; Chapple, 1982; Wheelock, 1989; Miller, 1994; Miller, 1995), which, in the case of *ishvara pranidhana* meditation, is *ishvara* (god).

By definition meditation requires a singularity of intention (Chapple, 1982; Miller, 1995, YS 3.2). Singularity means that not just one or some of the thoughts must be directed towards *ishvara*, rather, all of the thoughts are. Feuerstein (1979) explains that in yogic theory, in the phase of *dhyana* (absorptive meditation), "the presented-ideas are consistently associated with the object of concentration until no foreign thoughts intrude and complete restriction (*nirodha*) is achieved." This process of sublimation is the means of restructuring thought. Numerous sources of scholarship on yoga (e.g., Feuerstein, 1979; Chapple, 1982; Wheelock, 1989; Miller, 1994) refer to this intention that mantra creates within the meditating subject.

As we have seen in chapter four, *ishvara* is a special case of *purusa* (Pfleuger, 2005). When practicing *ishvara pranidhana* the meditator holds the "singular" intention of seeing, perceiving, or coming into contact with *ishvara* or *purusa*. In this state, the

mind is fully absorbed in the thought of *ishvara*, as the mind's "truest" nature, and the meaning of the mantra: "I am that (Siva)" (Ortega-Muller, 1992). Because the person is paying attention only to the flow of thought surrounding the contemplated meaning of "I," yoga theorizes that the self (*atman*) becomes aware of itself at the level of consciousness (*purusa*) or ultimate reality. The act of meditation takes individual perception beyond a subject-object relationship.

As Chapple (1982, p. 114) elaborates, "Yoga is concerned with reality as presented by and arising from the intention and attention of the particularized consciousness" with the purpose of yoga to "break through to the point of consciousness where there is no distinction between seer and seen." The "particularized consciousness" Chapple refers to relates to cultivating liberative *samskara* or the conscious cultivation of the intention "I am that (Siva)."

Once one concentrates one's mind into an attentional state of *ekagrata* or one-pointedness, the mind's intentions contained within that focal point become the sole reality. In other words, this complex of intentions is what is "seen" by the seer. This is why Anandamurti insists that the mantra or focus of attention matters, (a position taken in tantric yoga, but not necessarily in Yoga of non-tantric persuasion). In this theory, then, sustaining attention to this focal point during meditation is what eventually dissolves the perceived boundaries or the mind's cognitive distinctions between the entity that is seen and the seer who witnesses that entity. This is a state of "existential unity" (Chapple, 1982).

While intentionality can be seen as the psychological mechanism of meditation, a number of scholars relate mantric utterance to intention in a way that could lead one to

see mantra as the physical mechanism of concentration. For example, Alper (1989) suggests seeing mantra as a "mechanism" for accessing a certain class of thoughts necessary to enter the desired state. Similarly, Timalsina (2005) underscores the significance of the act of joining *japa* (mantra recitation) with meaning as a primary tantric means by which the mind turns attention inwards and comes to rest. During *ishvara pranidhana*, practitioners use mantra as the means of sublimating (or associating) thoughts to (or with) *ishvara*.

Wheelock (1989) explains that the particular significance of mantra is that its proper usage requires feeling the meaning of the mantra, and utterance is precisely what effects the "restructuring" of thought because properly using a mantra requires a specific intention (or ideation). The silent utterance affects an embodied feeling throughout the various layers of the person. Wheelock views the function of language as a speech act and this function is significant because utterance does not merely express some idea, but involves accomplishing some purposeful act. In other words, by activating mantric utterance as a speech act, the tantric meditator implicitly intends some effect.

The effect of speech acts is usually to convey information. However, rather than communicating some information, Wheelock (1989) argues that the purpose of mantric utterance is to create and allow participation in a known and repeatable situation. Silent rehearsal is the means by which the tantric yoga practitioner participates in spiritual reality. Tantric theory holds that it is through such participation that the meditator comes to recognize the identity between the inner and outer realities of self and cosmos, respectively. In his examination of the relationship between the mantra and god, Oberhammer (1989) maintains that the presence of god is mediated by mantra; thus, only

mantra provides concentration with its natural content. Timalsina (2005) concurs by explaining mantra signifies the totality, and simultaneously refers to all aspects that the totality of the mantra embraces. This view rests on Oberhammer's inference that the relationship between the mantra and god cannot be identical with the linguistic relationship between word and its object in human language – it must be independent of linguistic conventions. This non-linguistic nature to mantra is critical for analyzing the cognitive reality of mantric utterance.

Along the lines of identifying mantra as a mechanism of attending to thoughts, Alper (1989) also calls mantra a "machine" of thoughts, since rather than being something that one uses to express a thought, mantras actually generate a thought. In this sense, Alper sees mantra as a cognitive tool, arguing that the mantra works as a mechanism to tune the mind to the object of attention. He shows that mantra recitation calls to conscious awareness the referent of the mantra – i.e., Siva, god, or *ishvara* – and as concentration on this object continues, one's mental state becomes absorbed in this thought. This means that because the mantra denotes god, during *ishvara pranidhana* when the meditator uses mantra the individual's subjective awareness becomes attuned to only that one object: god (*ishvara*.) The repetition of mantra is important but one cannot just mechanically perform the act. During the course of practice, mantras interact with the subjective awareness of the practitioner (Timalsina, 2005). During absorptive meditation practitioners consciously associate all the thoughts of the mind with the referent of the mantra – the reality of non-dualism or non-separation between subject and object - which is the object of meditation. Thus, the goal of tantric ritual is realized when consciousness of the practitioner blends with the thought-power represented by the mantra. More will be

said about silent rehearsal as a mechanism of attentional processing in the next chapter that links attention and memory.

There is another aspect to the theory of mantra being a generator of thought. Muller-Ortega (1989) explains that tantric mantras indicate the intention of Siva to emanate into worldly form, and the simultaneous intention that Siva and the entirety of the world – and this means the practitioner, as well - experiences becoming united as "one." Thus, the meditator's ability to cultivate a spiritual intention by uttering the mantra is due to the very nature of the mantra as intention born of Siva's will.

Wheelock (1989) explains that the tantric mantra is the "ritual terminus" or end game of the mantra and divine realm. In other words, actually feeling the intended meaning of the mantra is the end game for tantric yoga. This feeling is an embodied feeling because the goal of mantra is founded in the tantric conception of language that the "seeds" or *bija* mantras are fundamental constituents of the universe, and thus their utterance has a special effect within the practitioner's body. This link between the reality of the mantra and the practitioner's body is at the heart of understanding the physical mechanisms of absorption from the tantric yoga perspective. Therefore consideration of this point is continued in the next two chapters on the mental processes of memory and emotion in meditation on the issue of the basic evaluation of the mantra and how its use and resultant state shapes tantric theories of mantra that focus on how it leads to absorption.

In tantric theory, the mind is embodied within the physicality of the body. The Samkhya system that is assumed by Yoga provides ideas about the how the physical links of this attunement process becomes enacted in the body. Such links are embedded in

Larson's (1969) explanation of the mind's constitution in physical substance. According to Larson's explanation of Samkhya, the mind (*citta*) extends through sensory organs (*indriyas*) to actually make contact with worldly objects, and it is through this contact of the mind with the world that objects are known. In the tantric translation of this account, consciousness is continuous with the *citta* (mind) (Muller-Ortega, 1992); that is, consciousness exists within and not separate from the material substance of the world. Therefore, in tantric practice, it is also the individual consciousness imbedded within the *citta* that makes contact with the world. In states of wandering or unfocused attention, then, the *citta* becomes scattered about many worldly objects. The *citta* vibrates with the colors (or light energy), sound patterns, etc. of the world and this vibrational or resonant state is important for psychological functioning because the vibrational state of the *citta* (mind) plays an important role in determining the objects that attract the mind. But the resonance of the mind does not wholly determine the attentional focus of the person; as we have seen, individuals have the power to set intentions.

During meditation, the practitioner attempts to withdraw the *citta* from the world and concentrate the *citta* within one localized area (i.e., the *ishta chakra*) within the body. This involves the practitioner intentionally turning attention inward, focusing attention on the mantra recitation and visualization of its meaning, and consciously withdrawing the mind from the sense organs (*indriyas*), and from all the material layers of the body. Then, the practitioner further withdraws the *citta* from the tantric subtle body system of *chakras* and *nadis* described in chapters two and four. (See the section on tantric yoga mechanisms of emotion in the chapter on emotion for further elaboration on the tantric body systems that the *citta* moves through during the yogic withdrawal process.) Finally,

the mind becomes so focused on its object that it ceases to function in its normal modes. In this way, the mind becomes quieted from its activity of perceiving objects in the world and from the mental-emotional content of the mind associated with worldly perceptions and cognitions. This is the state of quiet the YS calls *nirodha*, the goal of Patanjali's Yoga, or what Abhinavigupta calls a state of "illuminated intellectuality." This is absorption and the state of consciousness existing during this period is the subject of many of the controversies between emic and etic views of meditation. Now let us continue our comparison of attentional processes by turning to examine the neuroscience mechanism of attention.

Neuroscience: Selection as the Brain's Mechanism of Shifting Attention

As we have seen, attentional focusing is a primary action that begins and sustains the practice of *ishvara pranidhana* meditation. *Ishvara pranidhana* meditation requires that the practitioner engage a number of attentional processes, starting with switching the attentional task from whatever task was previously at work and focusing attention to the meditation task. This may also include switching to the meditation task from the default mode in which the mind is not engaged in any particular task.

A number of lines of research all converge to indicate that selection is the brain's mechanism of attentional control as the brain switches between tasks and from object to object. Posner (1994) explains that the decision of what to select and where to focus is modulated by executive attention instantiated in the frontal lobes, and that the prefrontal cortex influences the parietal areas, which carry out the attention shifting and selection processes. Thus at least two coordinated processes are involved in enacting selection. On

the one hand, higher decision processes of goal orientation, values, etc. enacted through activity of frontal brain areas of executive attention, especially in the ACC and OFC, determine or set search properties and select tasks. On the other hand, the parietal areas receive all the incoming information and shift attention to selected properties according to the importance of incoming information and what needs to be encoded for higher brain processing of the task. These two systems are related in that the PFC modulates activity in parietal areas by supervising or recruiting posterior brain areas that modulate attention (Posner and Dehaene, 1994; Posner and Peterson, 1990), and the PFC affects excitability of neurons encoding the features of the "to be attended" or "to be ignored" stimuli during both perceptual and higher processing (Posner and Dehaene).

In the early phase of selective attention during any mental task, attentional networks are primed or tuned - a sort of programming process - to select for certain features of reality over others. These features are called attentional "targets." Attention networks can be primed or tuned to different targets or features of spatial, visual, and auditory stimuli over others. Tuning involves sensory systems reacting to external stimuli or energy in the form of light for the visual system, sound for the auditory system, or other forms of energy for other sensory systems.

Tuning is important because this process amplifies attentional processes. One study of attentional amplification of focused attention to color, form, or motion showed evidence for activation of a frontal attentional system, but no parietal activation was found (Corbetta, Miezin, Dobmeyer, Schulman, and Petersen, 1991). Evidence such as this suggests that priming to different features of targets seems to occur through activity in at least two different areas of attention networks in the brain: frontal areas process

color or form while parietal areas process location, although Corbetta et al. (1991) note that both might enter and amplify activity within the visual system at the same site in cases when the target is a visual target.

Posner and colleagues (Posner and Dehaene, 1994; Posner and Peterson, 1990) explain that guided search implemented in the brain by the anatomically distinct system of the anterior (or executive) attention system supervises the recruitment and control of posterior brain areas that modulate perception. The implication is that neurons extending from attentional control systems (executive system) in frontal areas to lower perceptual centers affect the excitability of neurons encoding the features of the "to-be-attended" or "to-be-ignored" stimuli during both perceptual and higher processing (Posner, et al. 1994). In *ishvara pranidhana* meditation, the "to-be-attended" stimuli are the mantra (discussed above) and imagery of the visualization; the location features are represented in the image of oneself sitting on the planet while form and motion are represented through the relationship of oneself to the cosmos.

By examining attention shifting processes from the perspective of thinking about how humans relate to the environment "out there," is becomes apparent that the environments some degree of control over cognition. This is because orienting is a search behavior that can be either voluntary (a self-regulated or controlled process in which the subject consciously controls the search processes) or involuntary unconscious orienting (an automatic process in which outside events solicit attention) (Posner, 1994, 1990). Involuntary orienting occurs when environmental stimuli automatically command a person's attention by overriding conscious orientation processes. In instances of automatic orienting, as when exogenous sources of stimuli capture one's attention, search

is automatically tuned to those exogenous properties. For example, automatic attending might occur in stressful situations where there is an overwhelming amount of stimuli occurring in the environment. In such cases, the mind that was previously either attending to another task or in the default mode mentioned in the previous section as a wandering type of attention in which a default network is active in the brain (in this state, there is no selected task and therefore no focused attention) switches to automatically attend to the exogenous source of stimulus. During internally decided-on or goal-oriented tasks, such as meditation, however, specific instructions are imbedded within the idea of the task. In these instances, the executive system takes over control of attention (Posner and Dehaene, 1994).

It is not difficult to see that orienting requires attentional shifting. During the search process, attention moves from location to location until the target is detected. Shifting attention back to the selected task during meditation is an important and necessary skill because the mind has a natural tendency to wander and to be drawn to attend to competing stimuli in the environment. PET data collected by Corbetta, Miezin, Shulman, and Petersen (1993) showed that when attention is shifted from location to location, either voluntarily or as a result of being summoned by external events, the major focus of increased blood flow is in the superior parietal lobes.

Once one selects an attentional task, the process of covert attention shifting can carry out selection of important aspects of how we decide where to focus. Changes in attentional focus change the priority given to a stimulus (Posner, 1988; Posner and Peterson, 1990). Covert attention shifting moves attentional focus without moving the eyes or head, and is correlated with increased cellular activity in the parietal lobe

(Triesman, 2006). At the network level, attentional shifts correspond to changes in oscillatory patterns of brain activity between frontal and posterior areas. PET data support the clinical observation that the two hemispheres are not symmetric in blood flow increases in each hemisphere during attention shifts (Corbetta, Miezin, Shulman, and Petersen, 1993). PET studies also suggest that the anatomical circuitry that enables the parietal areas to selectively modulate brain activity in other pre-striate areas passes through the pulvinar nucleus of the thalamus (LaBerge and Buchsbaum, 1990). Importantly, activity in these parietal fibers is regulated by frontal areas (especially the PFC) thought to mediate executive attention.

A number of neurotransmitters are involved in the regulation and modulation of attention and it is likely that they all work together. For example, norepinephrine (Aston-Jones, Foote, and Bloom; 1984; Clark, Geffen, and Geffen, 1989; Posner, 1992; Bouret and Sara, 2004), glutamate (Bouret and Sara, 2004), dopamine (Ashby and Casale, 2003; Calabresi, Picconi, Tozzi, and Di Filippo, 2007), and acetylcholine (Clark, Geffen, and Geffen, 1989; Sarter and Bruno, 1997) have all been implicated in attention processes. However, it is difficult to tie specific neurotransmitters to specific functional features of attention and it is not clear whether particular neurotransmitters are involved in specific aspects of attention. It is almost certainly the case that all these neurotransmitters work together and can influence cognition by disturbing any one of the cortical functions.

Selection is aided by cues that help the primed brain selectively orient and attend to a particular stimulus in the environment over others (Fernandez-Duque and Posner, 1997). By tuning attention to certain features of reality, cues help a person pay attention to selected targets or tasks by guiding attention to the intended object. Cues can be or

become emotionally conditioned, and in this way emotion cues help define search boundaries by drawing attention to emotionally salient targets.

Widespread consensus exists that emotion modulates attentional processes. This is because in waking states, the mind either consciously or unconsciously searches for attentional targets that are presumably of some sort of adaptive value and emotion modulates adaptive processes (Treisman, 2006). Both frontal and posterior brain attentional systems are thought to work together to select tasks and targets that maximize adaptation.

A number of studies on the interaction between attentional and emotional processes have shown that the emotional salience of different stimuli can potentiate selection processes and command attentional resources (for review see Vuilleumier, 2005). Attention is directed to emotional stimuli especially during later processing stages of perceptual processing (Schupp et al., 2007). Schupp and colleagues (Schupp et al., 2004; Schupp, Flaisch, Stockberger, and Junghofer, 2006; Schupp et al., 2007) have proposed that data showing heightened attention to emotionally valenced stimuli might be interpreted in terms of a motivated attention model of emotional perception.

In this model, emotional perception is related to adaptive significance of stimuli. Support for this idea can be found in several studies that have shown that processing of emotionally arousing pictures such as erotica and mutilation engage motivational circuits in the brain (e.g., Lang, Bradley, Cuthbert, 1997); note that these images have meaning that is significant to survival. That negative pictures rated higher in arousal are often more correlated with a greater magnitude of ERP (e.g., Lang et al., 1997) (ERP is an electrophysiological measure of brain responses to an internal or external stimulus)

supports the idea of a general negative or threat bias. In this view, emotional bias to attend to threatening or otherwise emotionally stimulating cues presumably relates to survival needs. However, some data suggests that arousal rather than valence might be the dominant factor (for greater discussion of this point see Vuilleumier, 2005). This interpretation of arousal could help explain the longstanding controversial findings of arousal during yogic meditation instead of relaxation; thus, this positive arousal during meditation might be seen as an indication of meditation's adaptive value.

Emotional attention can also be conditioned (Stormark, Hugdahl, and Posner (1999; Vulilleumier, 2005). However, Sapolsky (2003) cautions that automatic responses can be conditioned to the point of producing too much stress reaction such that one automatically experiences motivated action as if responding to stress, and this conditioning results in plastic changes in the brain that can impair learning.

Understanding how the mind makes contact with the world from the neuroscience perspective is important because these mechanisms are basic to attention. Perceiving any object in the environment (whether it is the intended object or not) requires the transduction of energy by specific sensory organs, and the encoding of that energy into neural signals. That is, the person makes contact with the world when the energy outside of the person becomes integrated within the person. For example, to perceive a visual stimulus, light energy is chemically transduced into neural signals through the photoreceptors in the eyes, and then these signals are processed throughout the brain through various pathways involved in cognitive and emotion processes linked to attention. Similarly, detecting an auditory stimulus requires that the sound energy is mechanically transduced into neural signals as it travels through the physical structure of

the ear. Other types of stimulus also have energy transduction processes. These different forms of energy (sound, light, etc.) are what flow between the body and the environment and what the brain transduces into information about the world. This is the basic level of interaction that a person has with the environment from with to generate knowledge about the world.

Although these are sensory rather than attentional mechanisms per se, it is important to at least mention these here because it is by way of these mechanisms that the person is able to attend to some object in the environment. It is by way of these mechanisms of sight, sound, touch, etc. that a person comes to perceive some object in the world. However, during meditation, the mind turns attention "inwards" towards the subtler aspects of experience. Because the selection that happens in these states has to do with mental content rather than stimuli from the environment, we might infer that these normal mechanisms of transducing energy no longer dominate the basic level of mental processing.

This "quieting" of mental processing in relation to one's environmental context raises the question of how one would maintain the sense of separation between self and environment that normally exist. We concluded in the last section on types of attention that cognitive scientists who study and theorize about meditation have not yet conceptualized the "quieting" type attention; therefore, it is not clear how one might go about answering this question. It is important, however, since it bears on our question of what reality neuroscientific understandings of mental processes depict. Therefore, it is one we will return to in the last chapter when we step back from specific mental processes to take a broader look at cognition. In conclusion, it seems that the

neurophysiological mechanisms of attention are not well understood, unless selection is defined very narrowly.

Comparison of Intentionality and Selection as Mechanisms of Concentration

There are a number of similarities in how yogic and neuroscientific systems describe the functional processes of attention. One primary similarity is that both systems emphasize the central importance of tuning attention to a chosen target or object. In the neuroscientific model, sensory targets guide attention so that a person knows where to orient. The process of searching and orienting toward a target operate within the yogic model as well. In this model, the act of *ishvara pranidhana* meditation begins with an intention to search for *ishvara* (the target), especially ishvara located within oneself. Because *ishvara* is theorized as being located within oneself, the meditator directs search activities inwards.

We might also think of mantra and visualization as "cues" that help orient and guide attention to the target of *ishvara*. However, in yogic theory mantra does not just represent *ishvara*. Rather, tantra elaborates the theory of mantra by suggesting that mantra in some way constitutes ultimate reality. According to tantra, mantra is of the same nature or essence as its "target" *ishvara*. Because of this sense, it seems more accurate to think of mantra and its visualization as the target or goal of meditation.

Another issue is the way in which each system employs the concept of "feature" in describing various aspects of reality to which attention may be directed. According to the neuroscientific model, in early phases of attention the brain selects for certain features of reality over others. These may be features of location, form, motion, etc. Thus features

provide some orientation to objects of attention. We can see that the imagery involved in the visualization of the mantra during meditation indicates these features. Location, for example, is designated by way of the visualized image of oneself sitting on top of the planet. Form and motion are also conveyed through the visualization as the visualization transforms the image reflected as oneself.

In addition to indicating an ordinary sense of each of these features (location, form, etc.), the yogic intention provides a meaningful sense of reality. For example, imagining oneself on top of the planet gives a present moment sense to reality. Also, the changes in form and motion that occur throughout the course of the visualization provide a meaningful understanding of one's relationship to the cosmos. These meanings are suggestive of the nature of reality – an experiential nature in addition to the physicality. The difference between neuroscience and yoga on this point is that this nature can become known through the observational methods of meditation but not through the methods of neuroscience.

A second way of comparing the mechanisms of intention from tantric yoga and selection from neuroscience is to say that they either differ or just have different language. This point raises the question of whether the concept of selection and intention are really just two ways of talking about the same thing – or whether these two mechanisms really reflect two different processes or perhaps aspects of attention and the mind. In one sense, these two are similar concepts. Both intention and selection are about or of objects and have a particular purpose or goal. Both also involve decision making and choice, and some action, and therefore explanations of each of these mechanisms

must deal in some way with agency and determinism. Both models provide ideational definiteness, conceptual unity, and overall coherence.

The issue here is whether intention can be naturalized in terms of the language of the brain. Current neuroscientific discussions of selection formulate the concept of attention in terms of brain processes in a way that make it difficult to locate the agency of a person within this account. Such attempts seem to lose some important element of agency that cannot be captured by descriptions of neurochemical and neurobiological processes. As of yet, it is not possible to derive a full account of intention within this framework.

In a third sense, the two systems differ in terms of how they each theorize the physicality of attention mechanisms. In neuroscience, the attention mechanism of selection is theorized in terms of the brain's activity, whereas in tantric yoga intention is theorized in terms of the physical structures of mantra. In the neuroscientific model, it is by way of activity in frontal areas of the brain that decisions are made concerning tasks and objects of interest that require attention. Likewise, it is by way of activity within and between parietal and frontal areas that the brain enacts further attention processes. In the tantric model, intention is theorized within the person in terms of a nexus of mental qualities, including a person's beliefs, desires, and will regarding meaningfully understanding the nature and purpose of one's existence. But intention is also theorized in terms independent of the person him or herself. In tantric theory, intention is attributed not just to an individual person, but also to *ishvara*. This intention signifies a cosmic purpose to evolutionary processes: that ultimately these processes have the aim of returning matter to its natural state, that is, primordial consciousness. This could be

understood as a subjective reality of attention. However, tantric yoga also theorizes a physical mechanism. Intention for both an individual and *ishvara* is theorized in terms of sound: mantra. This physical mechanism differs quite significantly from the neurobiological and chemical physical mechanisms of selection in the brain. This difference highlights the different models of the body between the two perspectives.

This comparison highlights a crucial difference in the approach each system takes to understanding meditation. The physical processes of the brain can be observed and analyzed through laboratory methods whereas the subtle processes of mantra that are expressed within the subtle body system of the *tattwas* (elements), *chakras* (energy centers), and *nadis* (channels) are difficult, if not impossible, to observe and measure with scientific instruments.

3. Ways to Sustain Concentrated Attention

Tantric Yoga – Purifying the Mind Helps Concentrate It

As we have seen regarding the role of mantra in the intentional process of focusing attention during meditation, mantra functions at one level as an object to which one can direct attention, with *japa* as an ongoing task to perform. However, on another level mantra functions as a mechanism for purifying the mind as a means of sustaining attention to the meditation task. In this sense, the mantra is recognized as part of the deep structure of the person's body/mind physicality. Mantra is the physical mechanism of attentional focus and intentional processes.

The act of shifting attention to the object denoting *ishvara* (god) during *ishvara pranidhana* – that is, shifting attention to the mantra – begins what yoga literature calls

"purification" of the mind and body (Pensa, 1969). This purification allows the meditator to continue focusing on the intended spiritual goal. Thus purification processes are a means to sustain concentrated attention, and, reciprocally, the process of sustaining the state of absorption "purifies" both the body and mind. But what about the mind is really purified? In other words, what does purification mean when we talk about mental states?

Scholars have written about *vikalpa-samskara* as a process identified within Kashmiri Saivite tantric yoga practices that purifies or refines mental states and logical constructs (Rastogi, 1992; Muller-Ortega, 2005). Muller-Ortega (2005, p. 204) explains that by means of this process, "the fundamental constitutive and even axiomatic presuppositions or 'holdings' of the yogin's mind are systematically transformed and refined." This refinement or purification allows the mind to enter states of awareness in which the flawed and limited prepositional understandings are "expanded, illuminated, and refined to a great degree." Muller-Ortega defines this liberated state of knowledge in contrast to the ordinary "unenlightened" state in which "the reality of the perceived or conceived object of perception is incompletely or only superficially disclosed or revealed to the mind" (Muller-Ortega, 2005, p. 197). In this ordinary state, when attention falls upon an object, the mind perceives the object only incompletely or superficially such that it appears as a distinct and separate thing. In non-meditative states, the deeper structure or reality of the object is not perceived. Instead, what is perceived are the "axiomatic presuppositions" or the mind's "holdings" related to the object. For example, when attention falls to a table, what is seen is "a table." The concept of table becomes known when one perceives the form of a separate object. Even the concept expressed in a particular language is experienced. The functionality and superficial form of the object

are seen. However, with sustained attention to objects, such as during yogic practice, tantric yoga theory asserts that a deeper reality becomes perceived. If one continuously concentrates attention on silently repeating a mantra and contemplates the meaning of that sound, some deeper reality of the object denoted by the mantra will engulf the mind, and this is what Muller-Ortega means by a "refined" mental state. Rastogi (1992) explains that according to Abhinavagupta, for yogins a loss of mental states results in blissful inner experience. The mind becomes refined in the sense that the mind penetrates into the essence of the object rather than remaining in the mental constructions. But it is only with this sustained focused concentration on the object that such deeper understanding can become illuminated.

Turning to the Yoga Sutra can help advance a better understanding of the yogic perspective on what needs to be refined or purified in the mind. In his essay *On the Purification Concept in the Indian Tradition, with Special Regard to Yoga*, Pensa (1969) defines the concept of purification in yoga in terms of *klesha*s (afflictions) and the *gunas* (binding forces). He (p. 204) explains that the *cittavrtti* (mental processes) may be affected to a greater or lesser extent by "impurities" or *klesha*. The *klesha*s were identified in chapter four: ignorance, ego, attachment, aversion, and the will to live. Also mentioned in chapter four was that others have translated *klesha* as "affliction" (Feuerestein, 1979) or "force of corruption" (Miller, 1995). Both these translations also convey a sense of "impurity." Any time one or more of these *klesha*s operates in the mind, this is an "impurity" since, as the point has been well made in yoga literature (e.g., Pensa; Whicher, 1997), the operation of any of the *klesha*s colors the mind's perception

of objects and the world. Conversely, removing the influences of the *klesha*s on the mind through refinement processes leads to the mind's purification.

Pensa (1969) also develops the notion of purity as mental *sattva*, with *sattva* being the sentient force of the cosmos that operates to regulate the mind (Eliade, 1958). Pensa (pp. 207-208) writes, "Purity generally stands for purity of the mental *sattva* (*sattvasuddhi*) even if the yogin's final step is that of freeing himself from the *gunas* (binding forces) in entirety and hence also from the *sattva*." When under the influence of *tamas* (static force) or *rajas* (active force of the passions), the mind expresses *klesha*s. Individual mastery over these cosmic forces that bind the mind is thus part of the liberating path of yogic practice that eliminate all impurities and suffering. As the mind becomes less under the influence of *tamas* and *rajas*, the quality of *sattva* comes to dominate it. When under the influence of *sattva* as the dominant *guna* (binding force), the mind expands and begins to vibrate at purer levels of *sattva* and beyond (with the final step being to free one's self entirely from all the *gunas*). It is in this refined state that the mind undergoes the yoga process of cessation or quieting of mental processes: the purification process known as *nirodha*.

There are a number of means to enact purification, including *ishvara pranidhana* (Pensa, 1969; Chapple, 1982). Aside from the physical practices of hatha yoga and astanga yoga such as asana and *prana*yama that have a purifying effect on the body, *ishvara pranidhana* incorporates within its process mental practices of tantric meditation that are defined by their supposed purifying effect on the mind and body because these processes are believed to refine the underlying material elements. In Anandamurti's method of *ishvara pranidhana*, these purification practices are the *suddhis*. These

practices are said to withdraw the mind from its attachments to objects of the world. Among the *suddhis* described in chapters two and four is the well known tantric practice of *bhutasuddhi* elaborated in chapter four. This practice involves a visualized dissolution of the objects or elements (*tattvas*) of the yogic subtle body (White, 1996), the theorized elements taken from the Samkhya system that constitute physical embodiment. In the Samkhya-Yoga process of cosmic evolution, *citta* evolves into denser manifestations that give rise to human form (Larson, 1969). During meditation, a reversal process occurs whereby the evolutes "dissolve and sublimate" systematically in the reverse order of their manifestation (Muller-Ortega, 1992). This reversal process is intimately linked with the shift in domination of the *gunas* (binding forces) on the mind. It seems that these purification processes of dissolution and sublimation support meditation by sustaining concentration and intentional focus on the goal of *ishvara*, because as the mind's manifestation in the form of various evolutes dissolves, its attention is no longer drawn to these worldly objects. The pull of worldly attachment sublimates to attraction to the new "object": *ishvara*.

After completing *bhutasuddhi* so that the mind has become withdrawn from bodily attachment, *ishvara pranidhana* meditators then proceed to the purification process of *citta suddhi*, in which they purify the mind and its mental states. During this phase, the meditator continues to focus attention on the object of the mantra and to contemplate its meaning through visualization. This sustained attention to the objects of meditation purportedly allows the mind to penetrate into "the true nature…of the perceived, conceived, or mediated object of knowledge" (Muller-Ortega, 2005). As mentioned in the previous section on mechanisms of attention/concentration, for

purification of the mind, Timalsina (2005) explains the function of mantras is to interact with the subjective awareness of the practitioner. Whatever thoughts, conceptions, presuppositions, or ideas held in the mind, the mantra interacts with these to purify the mind from them, so that they are dissolved and no longer there. Timalsina (p. 216) goes on to say that in expansion, "mantra is … of the nature of reflection in which all words, thoughts, imaginations are enveloped in an awareness that is identified as that experience which permeates all instantaneous cognitions." Timalsina explains that mantra recitation removes in-the-moment identification with the outer layers of self, and thus allows awareness of one's inner nature to emerge. When mantra is fully resonant, the meditator gains awareness of divine consciousness. By illustrating purification in the three levels of identity and individuality - the body, a social awareness as self-identity, and an inner sense of "I-ness" – Timalsina develops the complete "I" sense purportedly experienced during meditation as the "mystical" or "transcendent" feeling.

One of the vital tools of purification and refinement of mental states is the set of new intentions one cultivates to establish contact with *ishvara* and thereby attain liberation. Muller-Ortega (1989) focuses in part on the need for the yogin to entertain an opposite *vikalpa* [*samskara*] to purify or concentrate the mind. Let us again draw from the Yoga Sutra and scholarship on it to explicate yogic processes that involve *samskaras* (memory traces) and, in particular, the cultivation of liberative *samskaras*, since both classical and tantric yoga traditions connect on this point. Pensa (1969) and Whicher (1997) both discuss this process of cultivating "liberative *samskaras*" revealed in YS 1.50. In this *sutra*, we learn that the subliminal impression "generated by wisdom stops the formation of other impressions" (Miller, 1995, p. 35). Pensa points out that by the act

of meditation, meditators change "the mental coloring … by inverting the more usual course of *samskara*" (p. 205). To explain this process, he (and others; e.g., Whicher) emphasizes the important point that the goal of liberation, that is, the intention to attain the goal of liberation, must be "'sown' continually" (p. 205). Pensa explains that liberation is achieved on the condition that through adequate purification, the mind (*citta*) produces "the necessary amount of karmic impulses endowed with the specific quality of giving rise in their turn to liberation" (p. 205). New *samskaras* arise from yogic knowledge attained in various states of *samadhi*. In his article *The Liberating Role of Samskara in Classical Yoga*, Whicher (2005) talks at length about this process of generating the proper *samskara* that supports purification and sustains attention in a state of meditative absorption. Pensa notes that the *nirodha* or "halt" of mental activities itself still continues to produce "constantly renewed impulses" because they are *samskaras* with a "halting" *purpose* or seed. These are *samskaras* with an inward turning impulse or drive rather than one going out into the world. Pensa explains that the main point of reaching a state of "irreversible" purity (in addition to destruction of negative *karma*) is cultivating a set of intentions and guaranteeing that they are sufficiently clear and precise to produce the right quality and quantity of *samskaras* required for attaining the final goal. These are *samskaras* of higher knowledge.

A deeper lesson of tantric yoga (one that distinguishes it from Classical Yoga) is to dwell in this state even while the eyes are open (Lidke, 2005), i.e., out of the "meditation," and perceiving the outside world. In this state, mantra is inseparable from reflective awareness: the individual recognizes himself in the form of the mantra – this experience is what mantra means. Lidke explains that this is an extroversive process and

the ultimate culmination of practice, wherein the tantric attains a state of consciousness in which the inner and outer become united in the singular continuum of consciousness. The idea is that the consciousness is always there permeating our bodily self, but that we just need to attend to this consciousness continuously.

Neuroscience: Sustaining Attention to the Meditation Process

In addition to the ability to focus attention on intentionally selected objects, meditation requires continuous concentrated attention to the selected task: that is, the mental process of sustained attention (Lutz, Slagter, Dunne, and Davidson, 2008). Posner and colleagues have explained that a state of sustained attention is attained through activity of fronto-parietal regions. Sarter, Givens, and Bruno (2001) explain that sustained attention is a top-down process activated by the executive attention system and facilitated by basal forebrain cholinergic inputs to the cortex. For a review, see Sarter and Bruno (1997), especially regarding the role of cortical cholinergic inputs in a person's ability to detect and select stimuli, and allocate resources to these functions.

The PFC is the primary structure associated with sustained attention (Goldman-Rakic, 1987). For example, the ventrolateral PFC plays a role in resolving distracter interference, and the medial PFC filters out distraction (Jha, Fabian, and Aquirre, 2004). Also, the dorsolateral PFC (DLPFC) sustains attention to task relevant targets, but can be deactivated by emotional distracters, while the ventral PFC is activated by emotional distracters but deactivated by task relevant neutral targets (Yamasaki et al., 2002; Fichtenholtz et al., 2004). To help explain how the brain filters out distractions during periods of concentrated attention, Chen and Triesman (2008) suggest a gradient

mechanism of increasing attentional suppression from the periphery to the center, and propose that this mechanism explains the finding that distracters interfere less when in a central rather than peripheral location.

To keep attention focused on a mental task or to maintain continuous orientation to the selected target over time, the brain monitors task performance. The monitoring task has a number of names because research over time has distinguished several aspects of the monitoring process. Task monitoring, target monitoring, error monitoring, action monitoring, inhibitory monitoring, conflict monitoring, reward monitoring, and expectation monitoring all describe discrete monitoring processes. In early work characterizing a brain mechanism dedicated to monitoring task performance and compensation for errors, Gehring, Goss, Coles, Meyer, and Donchin (1993) describe EEG evidence for an error detection and correction system. Specifically, they identify a particular error signal as a component of the human event-related potential, a signal they called error-related negativity (ERN). Activity reflected by ERN is interpreted as inhibition and correction of an error as soon as an error is detected.

Gehring et al. (1993) and others (e.g., Dehaene, Posner, Tucker, 1994) have shown event-related potential (ERP) evidence suggesting localization of the error detection and compensation system in the anterior cingulate cortex (ACC) and supplementary motor areas (SMA), as well as in the midline or medial PFC. More recent EEG (Van Veen and Carter 2002 a, b) and imaging studies (Marco-Pallares, Muller and Munte, 2007; Ridderinkhof, Ullsperger, Crone, and Nieuwenhuis, 2004) corroborate findings that ERN, and thus error signaling, emerges in the ACC.

At the cellular level, Holroyd and Coles (2002) attribute changes in ERN amplitude (the signal of sustained attention) to phasic changes in the firing of dopamine projections to the cortex. It is well known that the ACC receives inputs from dopaminergic midbrain areas (involved in emotion processing), so some interpret ERN as a consequence of affect-related changes in dopamine levels. This is supported by the evidence that the ACC and OFC are related to reward and reinforcement information from the striatum and amygdala, and that the cingulate is sensitive to pain as well as reward. Thus, reward may be related to error monitoring and help to predict daily stress regulation (Compton, Robinson, Ode, Quandt, Fineman, and Carp, 2008). The noradrenaline system also plays a modulatory role to ACC via the locus coeruleus projections to the ACC. The locus coeruleus is the brain's principal site for synthesis of noradrenaline, and through the regulation of this biochemical, the locus coeruleus mediates sympathetic effects during stress in the brain (while the spinal cord controls sympathetic effects of stress through release of epinephrine from the adrenal glands). Furthermore, the ACC is a key structure of the autonomic nervous system and regulates attentional and affective as well as autonomic (including sympathetic), resources related to response selection (Wiswede et al., 2008).

At a theoretical psychological level, Reason (1990) distinguished between two types of errors: slips and mistakes. Slips occur when an error is made while executing a selected motor or action program. Mistakes reflect selection errors when, for example, one selects inappropriate intentions based on faulty knowledge. Dehaene, Posner, and Tucker (1994) suggest that ERN reflects slip-type error, and indicate that no ERN was observed in their experiments after mistakes. Thus, task monitoring during *ishvara*

pranidhana should, at least initially when the meditation is object oriented, indicate a slip-type error when attention wanders from conscious orientation to the meditation objects of mantra and visualization, thus establishing whether attention is being sustained on these processes. Attention shifting to any distractions would presumably trigger an error signal.

Marco-Pallaarres, Camara, Munte, and Rodriguez-Fornells (2008) suggest that an inhibitory mechanism increases cognitive control after slips. Right-sided frontal activation in the DLPFC and other frontal areas was correlated with adaptive action after the error. Thus, activation of right sided frontal areas could indicate fluctuation of attention away from the task as the meditator tries to gain focused attention. But as meditation moves past its purification stages and settles into the phase of absorption (*dhyana*), the meditation objects dissolve into subjective experience. What happens to the monitoring process in this phase of *ishvara pranidhana*?

A number of studies have shown that emotion can modulate ERN amplitude (an indicator of the executive process of error monitoring or detection). For example, several studies have examined the correlation of ERN with emotion in groups with long-standing negative emotional conditions. Hajcak, McDonald, and Simons (2003) showed that ERN amplitude increased in subjects with increased anxiety. Luu, Collins, and Tucker (2000) showed that college students with high negative affect and emotionality displayed higher ERN amplitude than those with lower negative affect and emotionality. Also, several studies have reported an increased ERN amplitude in obsessive-compulsive patients with high negative affect (e.g., Hajck and Simons, 2002). More recently, Wiswede, Munte, Goschke, and Russeler (2008) demonstrated that even short-term affective modulation

impacts ERN amplitude by showing emotionally valenced pictures to normal subjects. Taken together, these studies all demonstrate that emotion interacts with executive processes of sustained attention, particularly in action monitoring.

In addition, recently Brazil et al. (2008) discovered that error monitoring has two phases, and that the second phase plays an important role in the ability to modify behavior. This study showed that psychopaths show proper functioning in the early stage of error processing in the form of automatic behavioral adaptation, but that they have deficits in the later stage of error processing when controlled (i.e., conscious) behavioral adaptation is required. Brazil et al. asserted that this second phase correlates with a second component of ERN, termed error positivity, which in the case of the psychopaths examined in their study, corresponds to the inability to effectively use error information to change behavior adequately. This finding helps explain the observation that psychopaths have a reduced ability to successfully learn and adapt overt behavior. Thus although the monitoring process required for sustaining attention can be modulated by emotion, emotion is also necessary for the brain to translate error signals into action impulses and adaptive behavior. However, while it is clear that emotion plays an important role in modulation of action monitoring and initiating adaptive behavior, a precise understanding of the role of emotion on generating adaptive action impulse still remains to be shown.

Lastly, I found that there is growing evidence suggesting alternative interpretations of ERN as an error signal within the context of action monitoring. For example, ERN could be seen as a reflection of response conflict rather than detection of errors (Botvinick, Braver, Barch, Carter, and Cohen, 2001) and as a negative reward

prediction error signal (Holroyd and Coles, 2002). Moreover, Oliveria, McDonald, and Goodman (2007) argue that ERN is not limited to error signaling, but can also signal a change in expectation. Thus, they interpret ERN as a more general performance monitoring system that is activated by violations in expectancy. Thus, a number of studies show that monitoring is not always about error, but also about conflict, reward, and expectancy (e.g., Van Veen and Carter, 2002; Jha, Fabian, and Aguirre, 2004); these themes all indicate that emotion plays a role in executive monitoring processes of sustained attention.

Comparison: Ways to Sustain Concentrated Attention

When comparing tantric yoga and neurophysiological processes of sustaining attention, I noticed that the two accounts had different levels of discourse. Tantric yoga accounts of purification deal with content in the mind such as conceptual content while neurophysiological accounts focus on what occurs in the physical operations of the brain. Thus, neuroscience accounts of sustaining attention are primarily causal accounts of the process of filtering distractions. Tantric yoga elaborates on what is being refined during periods of sustained attention while meditating in terms of perceptions that distract an individual from sustaining focused attention.

Both yogic and neuroscietific perspectives suggest that emotion modulates the ability to sustain focused attention, and especially that negative emotion inhibits the ability to sustain attention. This could be because neuroscience studies of emotional modulation of monitoring processes deal with emotion in terms of its content. The categories of emotion targeted for investigation are those of everyday emotions. Thus,

comparison at this level of content shows a similarity. Studying the effects of emotional states during meditation on the ERN would thus be one way to bring these two perspectives into closer dialogue. In this way one could determine the impact of meditation-type content on the physical processes of the brain.

There could also potentially be a comparison at the level of physical mechanisms because tantric yoga does offer some account at the physical level - this view indicates that meditation causes purification of material structures. Tantric theory holds that changes in the formation and dissolution of the material principles of the cosmos (i.e., the *tattvic* elements) operate in the body and affect the ability to enter and remain in purified states. This embodiment is theorized even though the *gunas* (binding forces) and *tattvic* (elements) are cosmological principles. Therefore, to the extent that these forces and structures operate within the head and penetrate within the nervous system of the body, then this activity would logically converge with the activity studied by neuroscience. According to the inductive logic advocated by Whewell (1840), this scenario provides a "consilience of inductions" because in this case explanations about one class of facts (from neuroscience about brain processes during states of absorption) coincides with an induction obtained from a different class (tantric yoga about mystical phenomena). However, even though these structures are talked about in yogic texts as principles or elements of materiality, we should understand these as experiential categories rather than as indicating some ontology about materiality.

Because the comparison is difficult to make on this point because the two accounts of the physical body are so different, further examination of these two different

models of the body is necessary. This further comparison is made in the next section as we develop further understanding of the processes of meditation.

4. Implications: Amplification and the Overlap between Imagery and Perceptual Processes

Much empirical data about attention, including the research discussed above, is based on studies of perception of environmental stimuli – perception of the "outside" environment. But in yogic meditation, the meditator limits sensory input by turning attention inward, aiming to perceive "inner" realities. The yogic practice *ishvara pranidhana* uses visual and auditory imagery as vehicles to meditate, with these meditation cues operating in the meditator's mind rather than being objects located "outside" the physical boundaries of the meditator's body. In the beginning phases of meditation, the meditator's perception of the cues is that they are internally located because of a perceived awareness of a separation between one's self and the world. Thus, these perceptual cues form mental images.

Research on imagery may be particularly helpful, then, in efforts to understand attention processes of meditation. Imagery research closely ties into attention literature, since both address perceptual processes and their mechanisms in the brain. Since much is known about perceptual processes, and since many of the same processes used in perception are also used in imagery, many of the insights gained from perceptual research can be used to advance understandings about imagery processes. (For a review of evidence that supports this inference from perception research to imagery, see Kosslyn (2005) and Finke (1985)). Significantly, studies of imagery suggest that imagery operates

in each sensory modality. Thus, for *ishvara pranidhana* meditation, both the visualization and mantra fall into the scope of research and findings about imagery, since they operate in both the visual image modality and in the auditory modality, respectively.

Therefore, there are two implications of this analysis of the similarities and differences between yogic and neuroscientific models of attention as cognition: 1) we are challenged to examine more closely what reality is depicted by each model and 2) we need to acknowledge our uncertainty about the role that amplification has in describing or explaining this reality.

One fact about the brain that has come to light from my discussion of attention processes is that amplification processes in the brain help tune attention to particular features of reality over others. This perspective implores us to consider ways in which the brain's ability to select for certain features of reality over others (such as our mind's observations of its own patterns) might be involved in generating perceptions supposed during meditative states of absorption. We have also established that the methods of *ishvara pranidhana* – that is, mantra and visualization - help to tune attention to the reality of ishvara.

These results are especially important in terms of defining an individual person's relationship to this reality of the mind's patterns of thought. The thought about the essence or nature of the "I" feeling or the self takes on particular importance because the process of selecting for features of reality that match this target suggest the need for some perspective that can convey to us the intended depiction and thus the state involved in its perception.

Let us now consider the implications of the situation in which attention is being attuned to the reality depicted by the yogic model. This bears directly on a consideration of the question of the limits of the scientific knowledge regarding amplification of certain features of reality over others. In part II I argued for an experiential or phenomenological interpretation of the yogic model. I also discussed how past efforts to bring together the two models of science and experience often attributed the findings of science to the yogic model without consideration of the conceptual challenges in doing so. Thus in this comparison, we must take these kinds of challenges seriously.

One of the challenges is that the scientific knowledge about amplification of certain features of reality over others in one's perceptual awareness during periods of sustained concentrated attention is derived from studies of sensory stimulation. This challenge relates to whether this scientific knowledge could apply to the situation when we attend to some non-physical dimension of experience, such as the case of visualization or recitation of silent or inaudible sounds, even if we attribute certain meanings to that non-physical dimension. We have already seen evidence in neuroimaging studies of meditation that this sort of experience can have specific effects on the functioning and structure of the body. I suggest that the implications are that we can attend to some dimension of experience and that if we attribute certain meanings to that dimension, it can have specific effects in the structure of the body. However, we must recognize that the attention used in the amplification studies pertained to observable features of reality. Thus, we are left wondering about features of reality that we cannot observe. Does this situation pose a conceptual challenge to the assumptions about the reality that we attend to?

What we are asking here is about the features of reality that one attends to, rather than about the effects of such attention on the brain, such as experiential realities that we cannot observe by the methods of neuroscience. Sensory objects can be measured. For example, we can measure the effect that different sounds or different visual stimuli have on the activity of the brain. But a mantra is inaudible; therefore, it is not possible to measure its sound frequency or level. The same is true for a visualization. Under experimental conditions, a scientist would need to be able to track the visual stimulus so that the trial could be replicated with the exact same sort of visualization, so that the measurements of the associated brain activity could be accurately correlated.

Studies of imagery can help here, since these studies examine the kind of phenomena involved in tantric visualization. But these studies are limited, too, when it comes to generalizing findings to the type of imagery involved in *ishvara pranidhana* because this meditation imagery involves multiple features of reality all at once, including features of meaning. This meaning dimension is what gives the meditation its experiential reality.

The issue here is the tension between the representational theory of cognition that underpins the model of the brain and the non-dualistic theory of tantric yoga. The representational model holds firm to the idea that there is some objective reality "out there" and that the brain's activity works to represent that reality, through the signaling of brain synapses. This model of the brain suggests that the activity of the brain corresponds to or represents the objects, events, and realities of the world. Even connectionist and emergent theories of cognition hold to representation (Osbeck, 2009). The problem with

representational theories of cognition is that this view (symbolic computation) yields a narrow conception of cognition. For example, this conception is limited in the sort of semantical representations it can make (Varela, Thompson, and Rosch, 1991). In reality, meaning changes for human cognition depending on different context and from person to person. The representational model of attention assumes that there is a world "out there" that is independent of our cognition. Thus, the function of cognition is to accurately represent this separate world. My comparison and analysis of attention processes of meditation challenges the epistemology and ontology underlying this perceptual experience.

The task of meditation involves paying attention to features of reality that are more abstract, such paying attention to the activity of subconscious or unconscious mind. This attention process involves the ability to infer one's relationship to the world beyond the boundaries of the skin, not just to an object, person, or event, but to the world at large, and is rather abstract. The self of neuroscience is usually seen as the "epicenter of knowledge, cognition, experience, and action" (Varela, Thompson, and Rosch, 1991, p. xvii) that is bounded by the body and contained, or coded (i.e. represented) somewhere in and by the nervous system. However, the tantric model suggests a reality of the self that transcends the normal bounded self: a self that extends the bodily boundaries, into the environment to the farthest reaches of the cosmos.

This tantric idea is not so very different from Merlu-Ponty's phenomenology of perception (see Varela, Thompson, and Rosch, 1991, chapter two) in which the world is inseparable from the subject. Varela et al. (1991) explain that a main insight from the philosophy of phenomenology is that we must recognize that the structure of the world is

something that we are, at least to some degree, structuring in our own mind. In this sense, the reality of *ishvara*, even though it depicts the cosmological reality, is not entirely "out there." The meditative process of conscious attentional refocusing on mantra counters the tendency to think of attention as being drawn into a dualstic objective world in which embodiment normally delineates separation between entities.

This conceptualization of cognitive experience necessitates that we consider alternative forms of cognitive behavior (Varela, Thompson, and Rosch, 1991). We need to come up with a way of talking about reality and the mind that honors both the facts about the brain and the phenomenological dimension that is embedded within the (theorized) potentiality of attention, and other facets of cognition. We have seen that the representation model depicts the cognitive behavior of attention in terms of the activity of parietal and frontal regions, and we have seen that this characterization of attention cannot capture higher functions such as intention. Varela et al. (1991, p. 102) explain that alternative conceptualizations of cognition offer potential avenues for bringing together the objective and subjective realities depicted by each system. For example, one could see the behavior of entire neural networks as cognitive and possibly even see that "non-neuronal networks" such as immune systems display cognitive properties. Describing the integrated functioning of the entire attention network that operates broadly across many anatomically and physiologically distinct regions of the brain on a moment to moment basis might achieve at least some intermediary step in the sort of conceptualization necessary to describe the autonomous functioning of the kind of attention involved in meditation. But accurately characterizing the dynamics of attention networks as they respond to the body's continuous engagement with "the world" as well as the brain's

other cognitive systems is a daunting task, to say the least. Let us now turn to examine another cognitive process: memory.

Chapter Seven

Memory and Knowledge

Storing impressions of the world in the mind is a basic process for normal mental functioning, as is the ability to draw from past impressions to aid in one's navigation of present circumstances. These memory processes and the learning that underpins them are important in both tantric yoga and neuroscience accounts of meditation. For example, Miller (1995) stresses that memory is "basic" to Yoga's epistemology and much is said about memory in yogic literature. Most prominently, memory (*smrti*) is given as one of the five main processes of the mind that is quieted during meditation and a particular kind of memory trace (*samskara*) must be cultivated during meditation (Whicher, 1997). A recently adopted perspective of neuroscience in the past three decades is that the structure of the brain changes with experience and that learning and memory processes are central to the brain's plasticity (Butz, Worgotter, and van Ooyen, 2009; Holtmaat and Svoboda, 2009). As discussed in chapter three, neuroimaging studies of meditation consistently show activation in the hippocampus during meditation (Lou et al. 1999; Lazar et al., 2000), whose main function is memory formation (e.g., Squire, 1992), as well as activation of memory networks such as the PFC, the ACC, and the parietal and temporal cortices (Herzog et al., 1990; Lou et al., 1999; Newberg et al., 2001; Lazar et al., 2000; Lazar et al., 2005; Brefcznski-Lewis et al., 2007; Lutz et al., 2008).

Therefore, based on tantric yoga's theoretical understanding of memory processes during meditation, and coupled with empirical evidence from studies showing that brain structures of memory and memory itself are influenced by meditation (Sreenivasan and

Jha, 2007), memory seems to be an important function to examine in this comparison of mental processes of meditation. The purpose here is to discuss the role of memory in ordinary and meditative states, focusing especially on understanding how meditation transforms memory processes during meditation and resultant effects on subsequent states, especially knowledge.

1. Types of Memory and Resulting Types of Knowledge

Memory is characterized best for explicit memory, or conscious intentional recollection. Unconscious non-intentional forms of memory are far more difficult to access experimentally. This difficulty in characterizing implicit memory relates to the challenges we have been discussing in theorizing meditation for two main reasons. First, meditation is an action that implicitly reflects meaning, and this makes it different from actions and behaviors that tend to be more instrumentally useful (Taylor, 1985). Instrumentality is the case for many behaviors chosen within experiments designed to test memory. Nevertheless, one way in which researchers do study implicit memory is by observing behaviors that enact or reflect procedural learning. For example, studying reaction time in controlled studies where meditation practice is the independent variable is one way to access knowledge about the effects of meditation. Yet we cannot infer from these kinds of studies much (if anything) about the state of meditation. This observation attests to the difficulty, or perhaps impossibility, in designing basic science studies that capture or correlate with the experiential events of meditative absorption. However, the basic and fundamental point of the investigation in this dissertation is to explicate the reality of meditative absorption. Thus, as we move through this comparison, one must

bear in mind the limitations that exist in terms of what kinds of memories and types of knowledge can be known through using the methods assumed by the emic and etic systems.

Tantric Yoga: Memory Traces in Yogic Praxis

There are many senses of memory conveyed in the Yoga Sutra. Perhaps most important is the type of memory (*smrti*) that is named in YS 1.11, as one of the five mental proceses (*cittavrttis*) that are to be quieted in yogic practice. In this context, *smrti* is the type of memory that recollects or brings to mind information about events or experiences from the past, as well as "learned ideas" (Miller, 1995). Yet there are other senses of memory that do not all fall under this concept of *smrti*; rather, we find a cluster of similar concepts that all have to do with *smrti* in a more general sense of remembering. For example, in YS 1.20, the word *smrti* is used again, but here, along with the sense of remembering, the sense of mindfulness is also conveyed (Miller, 1995; Feuerstein, 1979). In her commentary on this sutra, Miller (1995) points out the parallels of this sense of *smrti* (memory) with the Buddhist usage of *smrti* as mindfulness. And in her glossary (p. 96), she uses both memory and mindfulness as English translations of *smrti*, stating that "Patanjali's usage of the word seems to combine the ordinary sense of 'memory' and the Buddhist notion of 'mindfulness.'"

A person can remember or become mindful of many different types of things, and this cognitive flexibility becomes centrally important for the type of "remembering" that occurs during yogic absorption in *samadhi*. For what is "remembered" or brought into mindfulness during meditation is the sense of self that is not identified with past events or

experiences, which formulate the ordinary sense of self. As we saw in the previous section on concentrated attention, YS 1.3 declares that the refined or purified yogic states are ones in which one "abides" (Feuerstein, 1979) or "stands" (Miller, 1995) in one's true "essence" (Feuerstein) or "identity" (Miller), without the operations of memory or any other normal mental process including conceptualization. Thus, memory in the sense of *smrti* has to do with phenomenal experience in the sense that contemporary philosophers of mind such as Ty (1995) use it to indicate experience of the world. It is this experiential sense of *smrti*, the quieting of normal memory processes through yogic practice, along with the quieting of other mental processes or *cittavrtti*, which is the essence of transformation, and what leads to absorption in meditative states.

Another type of memory conveyed in Yoga is the sense of storage. To remember an experience requires some supply of "stuff" from which the mind can draw to reconstitute the experience. For example, Miller (1995) writes that past impressions are never lost, but rather "preserved" as memory traces (YS 1.11). This sense of memory does not convey remembering in the sense of recall but is more like storage or retention. This sense of memory reveals another dimension to *smrti* (memory), one that the Yoga Sutra introduces in YS 1.18 as the concept of *samskara* (memory trace).

Even though *smrti* and *samskara* retain a "sameness" in form (YS 4.9), these are distinct mental process: *samskaras* are subliminal impressions (Miller, 1995) that are present in "residuum" (Feuerstein, 1979) even after the quieting of the mind and normal memory processes (*smrti*) from yogic practice. Whicher (2005) explains that *samskara* (memory trace) has an obvious psychological significance. *Samskara* evokes the notion of the subliminal in relation to memory, as indicated by translations of *samskara* from

Miller (1995) as subliminal impression and Feuerstein (1979, 1998) as subliminal activator. Along these lines, Anandamurti emphasizes the causal nature of *samskara* in his translation of the term as reactive momentum. This translation is helpful because momentum taps into the connection that *samskara* (memory trace) has to action, since *samskaras* (memory traces) are formed as a result of any action.

In tantric theory, the ritual action of mantra recitation cultivates certain types of *samskaras* that are beneficial towards the goal of liberation from the bounded sense of self. During meditation, interiorizing (the mind focusing inward) as opposed to exteriorizing (the mind focusing outward into the world) *samskaras* are generated as memory stores in the mind. In this sense, *samskaras* act as "highly dynamic" (Feuerstein, 1998) or *driving* forces.

The concept of *samskara* as subliminal memory or stored reactive momentum is further broken down into two types of *samskara*: *vasana* or habit patterns and *karmasaya* or active *samskara* (memory trace). Whicher (2005) explains that *karmasaya* are the causal or active *samskaras* (memory traces) of one's present embodiment; these are a subset of *samskara* that are formed under the influence of *klesha*s or forces of affliction and impurity. According to yoga's doctrine of reincarnation, *samskaras* are carried over from life to life and thus accumulate from past lives; they can come to fruition in a present life even though the action that cultivated the reaction occurs in a past life. This is a very complex issue here that I will not address in the dissertation (see e.g., Feuerstein, 1998). *Karmasaya* are important for understanding absorption during meditation because they combine into a storehouse of habit patterns (Whicher) or memory traces (Miller, 2005), which dictate personality. Whicher declares these habit patterns as the

characteristic traits of the self's personality that are changed during meditation. In ordinary states when we operate from the normal sense of self, *samskaras* (memory traces) in the form of *karmasaya* or active *samskaras* and *vasanas* or habit patterns of *samskara* shape and determine how we "see" reality. *Samskaras* color the interpretations of events in terms of how we appraise our own feelings and to what we attribute emotions or describe causal influences.

During meditation, the mind counters the storage and expression of *samskaras* by becoming aware of its own patterned movements, and intentionally channeling all of the thought forms in the same direction (i.e., sublimates them to the mantra), and this movement changes habituated patterns. With this shift, the cognitive insight resulting from meditative absorption becomes relatively free from *samskaric* coloring, with some *samskaras* (memory traces) remaining depending on the level of *samadhi* entered. One of the characteristics of *ishvara*, with whom contact is made during meditation, is the lack of any store of "*asaya*" (YS 1.24), which Miller (1995, p. 35) translates as subliminal intention. In a sense, then, we might also view *samadhi* or absorption as a "type" of memory because *samadhi* is the instance of remembering one's true self or one's deepest essence. However, this sense of "memory" is closer to the yogic concept of knowledge, and knowledge has a special status in yoga.

Knowledge of *ishvara* is gained during tantric yoga meditation through three paths. Classical Yoga names *pramana*, translated as valid cognition (Feuerstein, 1979) or valid judgment (Miller, 1995), as one type of mental process (*cittavrtti*) of consciousness (YS 1.6), and identifies three types of *pramana* (YS 1.7): direct perception, inference, and authoritative statement. These can also be considered as types of knowledge in tantric

yoga (Hara, 1992). Hara identifies at least six other types of *pramana* (cognition or knowledge) from tantric texts, such as identification and intuition. He notes that these are all included in the three main types of knowledge discussed more widely in yogic literature, so my discussion will focus on the three standard types of perception. In tantric yoga, the particular type of cognition or knowledge sought after is the insight gained from contact with *purusa* or Siva, which is, as we have seen, is a type of *ishvara* or particular *purusa*.

In the beginning, the meditator takes on authority from the meditation teacher instructions about the technique and beliefs about the goal state. With personal practice, though, this knowledge is gained through direct perception of *ishvara*. However, as we have seen, such perception is not had through normal cognitive processes of memory, conceptualization, or even language, since the highest stages of meditative consciousness are beyond access through the act of mantra repetition: the mantra itself take hold of the mind. Thus the third method of gaining knowledge about absorption is the inference made following contact with *ishvara*. Inference about the passage of time and that one's conscious awareness was sustained beyond normal mental faculties leads the meditator to an insight that this was, in fact, the type of experience that occurred: a recognition or remembrance of one's essential nature.

Enumeration of these different types of knowledge is important for understanding absorptive meditation in the context of a discussion of memory because the YS explicitly names memory, as well as conceptualization, as mental processes that are not considered to be knowledge in yoga's sense of correct cognition. Yet according to yoga, knowledge to be gained during meditation is free from memory processes: it is a discriminative kind

of knowledge, an "in-the-moment" knowing not shaped by past or learned experience (Whicher, 2005). Thus, the cognitive realities of memory and knowledge have some discernable difference.

Neuroscience Types of Memory

Memory is classified into several different types of memory, depending on the defining characteristics of the original experiences. In the most basic distinction, there are two main types of memory, called explicit/declarative and implicit/non-declarative (Gazzaniga, Ivry, Mangun, 1998). There are also several categories within these two main distinctions. Explicit memory refers to the kinds of knowledge that we have conscious access to, such as personal experiences (episodic memories), and worldly knowledge (semantic memories) (Tulving, 1989). Implicit memory refers to knowledge that we have no conscious access to such as procedural knowledge and skills (Tulving, 1985; Lewicki, Hill, and Czyzewska, 1992). These different types of memories have at least somewhat distinctive processing and storage pathways. Explicit memories include self-referential or autobiographical knowledge, and are concept-based knowledge, either related to or not related to a specific experience. Many learned behaviors involve both implicit and explicit forms of memory such as learning languages and culinary skills.

The mental skills like other skills are a type of long-term implicit memory that is established with practice (Karni and Bertini, 1997). In other words, developing cognitive, perceptual, and procedural skills is practice-dependent, and is this is conceptualized as learning (Fahle, 2005). Moreover, practice dependent skill learning leads to plastic changes in the brain (e.g., Ziemann, Muellbacher, Hallett, and Cohen, 2001). The

procedural learning system is considered to involve the encoding, storage, and retrieval of the procedures requiring perceptual, motor, verbal, and cognitive skills (Tulving, 1985). Often multiple types of skills are involved in any given behavior (Kellman, and Garrigan, 2009). Therefore, learning a mental task such as meditation can potentially involve learning a variety of skill types, all of which likely interact. Furthermore, skill learning at least sometimes generalizes to other tasks (Fahle, 2005). For example, learned skills of reflective awareness transfer across domains of knowledge, and are not wholly context-bound (Perkins and Salomon, 1989). Thus the kind of cognitive skills learned during meditation might be seen as both specialized and general knowledge that transfers into other cognitive, perceptual, and action-oriented domains.

Studies of memory and meditation tend not to overly distinguish between these types of memory, instead focusing on either recall of explicit memory or some sort of performance skill. However, it seems possible that each of these different types of memory could be involved in meditation. I suspect that meditation necessitates episodic memory, as well as semantic and autobiographical features of the meditative experience, and implicit/procedural knowledge. For example, according to these definitions, personal mystical experience is an episodic memory, as are personal identifications, and self-representations (or self-schemas). Similarly, the steps and procedures of a meditation technique, for example the visualization and the mantra recitation processes, can be considered to be implicit memories, which improve with practice.

Memory Stages.

From the moment a person has an impression (whether conscious or not), memory processing is involved. Thus in neuroscience, memory is also conceptualized in terms of stages. The ones characterized here are best for episodic declarative memory: sensory, short-term or working memory, and long-term memory (Cowan, 2008). Cowan explains that the primary distinction between these stages is the time variance of the memory event: sensory memory is stimulus information from any sensory tract held in working memory for milliseconds to several seconds; working memory holds representations of stimuli in conscious awareness for seconds to minutes; and long-term memory holds information for days, weeks, or years.

Sensory memories decay when the physical stimulus is no longer present (Cowan, 2008). Some research suggests that meditation has an enhancing effect on sensory memory. For example, Srinivasan and Baijal (2007) found that concentrative meditation enhances preattentive processing (or sensory memory). However, because this type of processing has a short time of activation (sensory memory is more like attention in this sense) and because mantra and visualization operate as imagery during meditation rather than as physical stimulus in the ordinary sense, the focus here is on working memory and long-term memory processes.

Working memory has been conceptualized loosely as the maintenance and manipulation of information in conscious awareness (Funahashi, Bruce, and Goldman-Rackic, 1989; Sara, 2000). Working memory focuses on salient selected focal points of attention. Via working memory, perception of these selected events becomes translated into knowledge stored in long-term memory. This transference of information occurs

because shifts in attention impact memory processes and vice versa (Cowan, 1995; Cole and Schneider, 2007). Because memory influences attentional shifts, when meditation brings on attentional shifts this also impacts memory processes during meditation. Working memory and attention depend on one another in the sense that objects that are held in the focus of conscious sustained attention are maintained in working memory. I briefly overview aspects of working memory that seem to bear the greatest relevance to meditation. (For a more detailed review see Baddeley, 2000, 2001, 2003; Baddeley and Hitch, 1994; Smith and Jonides, 1999.)

We can assume that, because mantra and visualization are also held as the objects of sustained attentional focus, they are held in working memory during meditation. Similar to other executive functions, working memory operates at least in part via activity in the frontal lobes. Specialized cells within the PFC fire in instantiated fashion during working memory tasks (Funahashi, Bruce and Goldman-Rakic, 1989), and this coordinated sustained firing of these prefrontal regions is thought to be the neural instantiation of working memory operations (Chafee and Goldman-Rakic, 1998, 2000). In an early model of working memory, Baddeley (Baddeley and Hitch, 1974; Baddeley, 1992, 2000, 2003) proposed three components for working memory: a central executive, a phonological loop, and a visuospatial sketchpad. This model is a multiple component model, what has become known as the "standard" model of working memory. Braddeley and others (e.g., Knodo and Osaka, 2004) argue that, from the neurophysiological activity in frontal areas, the central executive, an attentionally limited control system, regulates the two "storage" systems: the phonological loop for processing verbal and acoustic information and the visiospatial sketchpad for processing visual and spatial information.

Although some aspects of this model may seem to be more mechanistic than theoretical, it is impossible to separate the conceptualized features of working memory from the mechanisms of working memory. I point out this difficulty because it shows the close link between theory and fact when operationalized constructs so closely describe physical processes.

There are alternatives to the multiple component model of working memory, with much agreement among alternatives, especially on the point of the limited attentional capacity (Baddeley, 2003). For example, Cowan (2008) emphasizes attention. But other alternatives such as Nairne (2002) and Ericson and Kintsch (1995) emphasize the long-term nature of memory in models of working memory. Also, Postle (2006) and others (e.g., Goldman-Rakic, 1987) argue that Baddeley's standard model of the central executive as a memory "storage" system cannot account for findings of a delay-period activity in the PFC. Instead of viewing the delay-period PFC activity as evidence of memory "storage," they argue that the delayed phases reflect an emerging process of memory. This view seems to fit with one of Postle's hypothesized functions of PFC working memory, which is to control the gain of activity in sensory processing areas of posterior cortex (Knight et al., 1999) in a manner that would minimize the disruption of working memory storage processes by suppressing the sensory processing of potentially distracting information in the environment. Thus, they argue that the delay-period activity may correspond to basal level of operation of such a distraction detection mechanism rather than an actual memory "store." Now I focus on the standard or multi-component model.

Ishvara pranidhana requires constantly reciting the mantra. In the multiple-component model of working memory, the phonological loop is one system by which sound and language are rehearsed and processed in the brain (Valler and Baddeley, 1984; Baddeley, 2003). The phonological loop of working memory is theorized as having two components: one holds memory traces in acoustical form, which fade within a few seconds, while the other subvocally articulates or rehearses information (Valler and Baddeley, 1984; Baddeley, 1992; Repovos and Baddley, 2006). The function of the rehearsal process is to "retrieve and rearticulate the contents held in this phonological store and in this way to refresh the memory trace" (Repovos and Baddeley, 2006, p. 7); thus, rehearsal forms a short-term memory store and information from other modalities enters only through recording into phonological form via articulatory rehearsal process (Valler and Baddeley, 1984). This resembles mantra in which sound and language are silently rehearsed. Subvocal rehearsal is associated with frontal and parietal areas (Brodmann areas 6 and 40 respectively), and usually the left side of these areas, while storage is thought to be in cortical Brodmann area 44 (Repovos and Baddeley, 2006; Baddeley, 2003; see also Vallar and Pagagno, 2002). When verbal information is "silently" repeated in the subvocal rehearsal system - as opposed to overt articulation - this rehearsal allows for fuller processing of the information before being transferred to long-term memory systems. This enhanced processing is likely to generate greater biological subilization at relevant connections, thereby increasing the strength of a memory trace of the auditory experience.

Ishvara pranidhana meditation also involves continuous visualization of the mantra to gain access into deeper states of absorption. Working memory also involves a

visuospatial sketchpad that maintains and manipulates visual and spatial information (Baddeley, 1992; 2003), with visual and spatial subcomponents of working memory operating somewhat separately (Della Sala et al., 1999; reviewed Repovs and Baddeley, 2006). Baddeley asserts that visual working memory is closely related to perception and visual imagery, although some argue that mental imagery has distinct components of both Farah and Hammond (1988). Baddeley (2003) suggests that since visual imagery integrates visual information from various sources, including long-term memory, the imagery representations might be held in the theorized episodic buffer rather than the visuospatial sketchpad.

Both the visuospatial sketchpad and the phonological loop are proposed to be regulated by the central executive (Repovs and Baddeley, 2006). Baddeley's concept of central executive is thought of as a supervisory attentional system by Norman and Shallice (1980) and is also what Posner and DiGirolamo (2000) call executive control, operated by the executive attentional network. Both of these alternative conceptualizations emphasize that the central executive component of working memory functions largely by regulating attention as a means to control working memory.

A number of separable attentional functions and capacities are attributable to the central executive (see Repovs and Baddeley, 2006 for review). For example, the central executive regulates the capacity to focus attention or divide attention between tasks, and regulates attentional switching. Moreover, increased attentional control is thought to increase working memory capacity (Barrett, Tugrade, and Engle, 2004). This attentional control regulatory capacity is especially important for understanding meditation since meditation training has been shown to improve attention and self-regulation (Tang et al.,

2007). This finding supports previous evidence that working memory can be trained (Olesen, Westerberg, and Klingberg, 2004). For example, Qin, Hermans, van Marle, Luo, and Fernández (2009) show that working memory activity in the PFC becomes impaired by psychological stress. Thus, there is another link here between memory processes and meditation, since meditation reduces stress (Benson, Beary, and Carol, 1974; Delmonte, 1985; Shapiro, Schwartz, and Bonner, 1998; Coppola, 2007). Along these lines, Sharma, Das, Mondal, Goswami, and Gandhi (2006), recently showed that Sahaja Yoga meditation (a form of Kundalini Yoga) is effective in improving working memory. Like Anandamurti's *ishvara pranidhana*, Sahaja meditation uses the yogic subtle body as a template for attentional focus during meditation, but unlike *ishvara pranidhana* Sahaja does not uses mantra.

In addition to regulating attentional processes, the central executive also relates the contents of working memory to long-term memory. Sara (2000) reviews the tradition of those who argue that "remembering is an activity similar to perceiving" in that it views present-tense experience "in light of past experience" (e.g., Bergson, 1896; Bartlett, 1932; Tulving and Thomson, 1973). For example, Tulving and Thomson (1973) described retrieval in terms of the mind integrating new information within a memory network that is "driven by" that new information. This conceptualization gives us the impression that cognition is, at least in some way, dependent on the environmental context. In current terminology, new experiences are said to "reactivate" - certain memories and the mind processes these past and current information streams together to form new impressions of the world. But the brain is not just driven by information about external events. It can generate information, too (Vogels, Rajan, and Abbott, 2005). This

additional aspect of memory suggests that cognition is also independent, at least to some degree, from the environment. Working memory is the mental function that operates on information stores that need to be manipulated, including complex binding and integration of new, old, and self-created information (Suzuki et al., 2004). Therefore, meditation, like any experience, should impact memory via attentional regulation and working memory processes.

Finally, Kosslyn (1988, 2005) argues that long standing evidence is now widely accepted suggesting that mental images, like perception, reflect principles of information organization in long-term memory. An individual's "knowledge about objects and events" determines the types of mental images one is able to form (Finke, 1980). Kosslyn theorizes that images are generated by activating the stored memories in such a way as to draw out the salient information necessary to form the desired image.

Comparison of Tantric Yoga and Neuroscience Types of Memory Processes

One can easily recognize an agreement between the two systems in general conceptualizations of memory processes in recording experiences and, especially, in recalling them. Both agree that recall affects present moment perception; yet relating the two perspectives when considering the yogic sense of *samskara* (memory trace) proves trickier. Some comparison could be made between the concept of *samskara* and long-term memory but on this comparison the two perspectives have different standards for what constitutes knowledge.

There is agreement between the two systems about understanding memory as recall in a broad sense. Recall is involved in both neuroscience concepts of long term

memory and working memory, and recall is also involved in both the tantric yoga concepts of *smrti* and *samskara*. This is the ordinary sense of remembering some past experience. However, the yogic concept of *smrti* is not like the neuroscience memory processes of encoding, consolidation, and storage. Yet, these processes do seem to be necessary to form the yogic *samskara* (memory trace) rather than having to do with the actual memory.

There also seems to be more specific similarity between the mental process of remembering or recollection in the yogic *smrti* (as a *cittavrtti* or mental process) and the analogous neuroscience conceptualization of recall in the brain, as it relates to working memory. Working memory retrieves information from memory stores to interpret the present. Both systems convey a sense of "in-the-moment" conscious attention to an object of interest, and blend attention and recall. In both, calling to mind past impressions in the present moment influences what we experience in the present moment. However, it is only a very specific sense of *smrti* (one that evokes the concept of mindfulness) that is like working memory in neuroscience.

In both tantric yoga and neuroscience memory and attention are interrelated processes. Working memory seems to function in a similar way as several different types of attention (e.g.,wandering, distracted, and forgetful), and these different types of attention are influenced by *smrti* (memory). Also, because cultivating *ekagrata* (one pointed concentration) is important to attain *nirodha* (mental cessation) and entrance into different stages of *samadhi* (absorption), memory processes are tied in with the meditative states.

Tantric yoga and neuroscience also resemble one another in the sensory memory stages. The "sense memory" of neuroscience seems like the sensory impression of yoga, because in both systems the body takes in energy from the world and the energy somehow forms or constitutes the impression (see attention mechanisms section). Early phases of meditation involve quieting fluctuations of memory (*smrti*) that drive shifts of attention and bring working memory to a state of sustained operation. In this mode, the long-term type of memory stores the momentary experience. This is similar to the neuroscience sense of experience or knowledge as moving from an impression formed in sensory memory (or attentional system) and progressing though short term memory to be stored in long-term memory is similar to the tantric yoga of *samskara* in which an impression is stored in the mind as a memory trace. In both systems, this concept of memory is not like recall, but like an early stage of storage.

Another commonality is that, for both systems, repetition is important to hold an object in conscious awareness in the absence of its physical presence. In tantric yoga, mantra requires constant recitation (or *japa*), especially during the purification processes of *ishvara pranidhana*, whereas subvocal rehearsal from the neuroscience perspective also requires continuous recitation. Also similar is that visualization requires constant recall in both systems. Thus, the rehearsal concept is similar between the two systems.

Another similarity is the way in which the yoga concept of *samskara* and the neuroscience concept of long-term memory compare. In the broad sense, they both have the sense of storage and long-term nature. Also, that *samskaras* are subliminal is a defining characteristic of the concept. Subliminality indicates processes that are not conscious. From a neuroscientific perspective, long-term memory can (and often does)

operate automatically rather than in a controlled way, suggesting that it operates subconsciously or out of conscious awareness. Procedural memory, especially, seems to operate largely out of conscious awareness (Lewicki, Hill, and Czyzewska, 1992; Fahle, 2005). This subconscious level of operation seems similar to the notion of subliminality.

Moreover, the yogic concept of *samskaras* carries with it the idea that a cycle of cause and effect operates in the realm of human action. In this view, *samskaras* (subliminal activators or reactive momentum) are accumulated through action such that when humans act, they generate a cycle of further *samskaras* that can only be broken through the practice of yoga. Neuroscience largely does not hold this concept of causality associated with long-term memory in the same sense; rather it has the notion that "outside" events and experiences are imposed on each person, and that it is through specific processes that evaluate processes such as saliency, attentional focus, and emotional salience that have influence on actions.

Last on this point of how *samskaras* and long-term memory compare, they both differentiate further sub-types. In yoga, *samskara* is discriminated into a subset of memory traces (*karmasaya*) that forms into a habit pattern (*vasana*), which forms the personality. Neuroscience differentiates further sub-types of long-term memory such as implicit (or procedural) and explicit memory, with episodic and semantic types of memory as further types of explicit or declarative memory. Some people see the collection of episodic and semantic memories as constituting personhood in some way, so these seem similar to the yogic subtype of memory that also relates to personality. Yet because it is more encompassing than specific types of memory, it seems that the yogic concept of *vasana* might subsume these neuroscience types of memory. This is because

vasana seems to more simply explain the role of memory in personality while neuroscience differentiates a number of specific types of memory, such as implicit or procedural memory as the memory of "how to" learning and episodic memory involved in self-representational cognition. Thus yoga forages a richness in its idea of memory trace (*samskara*) by embracing its "sameness in form" with *smrti* (memory).

While *samskara* and long-term memory are not identical concepts, they are similar in a general sense of storage, recall, and longevity. Thus, it could be that the type of "memory" involved in the meditator's recognition or remembrance of the self's nature, cultivated into recollection by the liberative *samskaras* intended during meditation, is a specific instance of long-term memory stored in the brain.

The last issue to consider in this comparison of types of memory is how each system accounts for knowledge, because yoga and neuroscience seem to differ in some important ways on this matter. A crucial point of difference is that meditative practice aims for a particular type of recall: the tantric yoga notion of remembrance that turns out to be directly unfiltered, "in-the-moment" experience. According to yoga, extinguishing the *samskara* is like drawing attention away from these phenomenal realities of past conscious experience and instead focusing on an "in-the-moment" experience. Neuroscience, or at least the theory of mind that underpins the materialist model currently dominating neuroscience, does not have this concept of unfiltered experience. Instead neuroscience has a representationalist theory of causality of the mind in which connectionism is thought to explain higher order mental processes. In this model, mental processes emerge from interconnections among networks of simple units. Thus, activity

at the unit level, or at least the collective activity among networks should, at least in theory, explain mental phenomenon.

For yoga, memory is not involved in the knowledge borne from gaining access into states of *samadhi* (absorption); memory must be quieted for yogic knowledge to occur. The remembrance connotation of memory in yoga is more akin to mindfulness of some natural state. In contrast, in neuroscience, present moment experience is shaped and formed by past experience and the present moment activity of the brain. This plays a crucial role in the big-picture difference between tantric yoga and neuroscience in interpretations of *samadhi* (absorption).

The type of remembrance borne from reflective awareness and mindfulness during *ishvara pranidhana* meditation depends on practice and devotion. This practice turned expertise makes meditation based in part on skill learning, and this learning is what changes the embodied reality of the practitioner. Similarly, practice dependent mental skills can also be learned from the neuroscience perspective, and this learning also changes the hard-wiring of the brain.

We must consider whether memory is involved in all experience. Both systems answer no. For yoga, the special case of yogic knowledge gained during high states of meditative absorption occurs on the necessary (but not sufficient) condition that the mental processes, including memory, become quiet. For neuroscience, while it is true that the brain typically draws from memory for experience in normal psychological functioning – the brain naturally does this, it encodes experience and forms memories all the time - there are numerous conditions in which past memories are not involved in experience. For example, simple conditioned responses occurring in single-trial learning

do not need memory. When someone wakes from anesthetization, no memories of self are needed to remember the experience of waking and coming out of influence of the drugs. But these examples do not seem to pertain to the high order complex state of conscious awareness during meditation.

How, then, can neuroscience interpret the finding of hippocampal activation during meditation? Could neuroscience reason from a theoretical perspective similar to that of yoga that hippocampal activation does not necessarily indicate memory functioning? There are some reasons to think so, and many neuroscientists would agree with this view that the hippocampus being important for memory does not equate with it being *only* important for this function. For example, the hippocampus is also highly active during sleep and this is related to "offline" memory consolidation (Stickgold and Walker, 2007). This sort of "offline" process could also operate during meditation.

Consider that the usual reasoning process is to accept the function typically assigned to any given structure such that when that structure changes activity we assume that that function first identified must be occurring on. Taking this typical perspective, one might interpret hippocampal activity during meditation to be a reflection of memory retrieval, that memory is active during meditation. Furthermore, one might infer that such evidence possibly supports the interpretation that cognitive appraisals that draw from past experience operate during meditative absorption, thus leading to the appraisal of a "transcendent" experience. But this is a faulty assumption. The function of the hippocampus is currently debated in memory literature, for example its role in sleep. Thus the hippocampus might have a wider role in participating in the regulation of the

range of consciousness (that is, ranging from unconscious states like sleep to partially conscious, to fully awake, to meditative states, etc.) than originally thought.

From the neuroscience perspective, we can consider implications of the fact that both sleep and meditation are examples of the independence of recollection and hippocampal activation. From a tantric point of view, a sort of reversal occurs during goal states of meditation. This reversal could be compared to the notion that rather than retrieval or recall occurring as the basis of hippocampal activation, activity in this region could reflect the activity of consolidation processes. In this view, memory centers of the brain would be active not in the ordinary sense of memory, but in the sense of formulating new impressions and storing the present-tense experience of meditation such as any insights or perceptions that arise during meditation. Whether recall is necessary for consolidation processes during a given phenomenon such as meditation remains to be determined. Perhaps it is unlikely that conscious recall is necessary for consolidation since consolidation occurs in sleep, but since meditation and sleep differ in terms of states of awareness it is possible.

This discussion has resulted in bringing to the surface the issue of conceptualizing what kind of knowledge comes from the state of absorption. Neuroscience might classify "yogic knowledge" (because the goal of yoga is to transcend knowledge and gain direct experience of the nature of reality) into the category of episodic knowledge. Such a classification could be based on the reasoning that the meditative event is essentially autobiographical. But in neuroscience, episodic knowledge is synonymous with episodic memory. The knowledge is memory, whereas in tantric yoga, yogic knowledge is claimed to be independent from any of the normal mental processes. With meditation we

have the condition in which the learning processes hard wire new skills into the brain's structure, and in this way certain aspects of learned behavior are not exactly memory-based in the sense of recall. But there is also the fact that new wiring does not obviate recall. One way to solve this conceptual difficulty could be to focus on the fact that wiring and neural activation are independent of function; then we might conceive of absorption as a state which uses the same neural circuitry as normal memory processes, but in association with different experiential states from those of normal memory. The subtle differences between memory and knowledge are more closely examined in the following section on memory mechanisms and also the implications of comparisons.

2. Mechanisms of Memory

The problem of trying to relate concepts to percepts is particularly relevant when trying to understand absorption in the two dimensions of physicality and embodiment. This is the case in absorption when the meditator perceives the reality of self and world during meditation and then infers that this phenomenological state is transcendent or mystical. This cognitive problem directly involves the meditator's concepts of self and reality, which influence the perception of mystical experience and meditative absorption. How the meditator relates the concept of mysticism to the perception of absorption during meditation is an important feature of the meditation experiential phenomenology. I will now analyze the processes of memory and knowledge that are involved in meditative cognition.

Tantric Yoga Mechanisms of *Smrti* (Memory) and *Samskaras* (Memory Traces), Especially during Meditation

In his discussion of *nirodha* and yogic praxis, Whicher (1997) refers to the "mechanism" of *cittavrtti,* the mental fluctuations (Feuerstein, 1979) or turnings (Miller, 1995). The *cittavrttis* contribute to the mechanism of both our karmic identity and spiritual liberation, depending on how experience is generated during a mental state; that is, whether the *vrtti* (fluctuation) is formed through shaping of past experience or unbounded by *smrti* (memory). In this sense, the mechanisms of the *vrttis* are "undone" during meditation. Thus, memory in the sense of *smrti* as a main *cittavrtti* is one mechanism of yogic transformation. Similarly, memory traces (*samskaras*) become mechanisms of meditative absorption. In this section we will examine the mechanisms of how this undoing occurs from the tantric perspective.

As explained in chapter four, a number of scholars have noted that all *cittavrttis* work in cyclical relationship with *samskaras* (e.g., Whicher, 2005; Eliade, 1958). For understanding meditation, the cycle of *samskara* - *smrti* – *samskara* is central (see Whicher, 2005), with memory as a causal force of action. Aspects of this analysis pertain to other *vrttis*, too, and not just *smrti* (memory), since identification with any of the *cittavrttis* (mental processes) constitutes the ordinary sense of self. Experience leaves impressions (*samskaras*) on the mind. *Vrttis* (mental fluctuations) produce *samskaras* and vice versa; both arise in the *citta* (the mind), which, as we have seen in chapter four, is within the material realm and not in *purusa* or the spiritual realm. Thus, *samskaras* (memory traces) function both as a binding and liberating influence, either in the form of

ignorance or knowledge depending on whether it is bound by the three forces ruling the flow of *prakrti* or matter (*tamas* (inertia), *rajas* (activity), and *sattva* (luminosity).

By analyzing the causal means or processes by which *cittavrtti* fluctuate, I discovered that binding is the mechanism of memory and *samskara* (as well as the underlying mechanism of all mental functions). To understand this mechanism, it is necessary to assimilate the role of the *gunas* (binding forces) on physical-mental events into the tantric yoga view of absorption; we will proceed towards this aim by focusing on the mechanistic role of *gunas* in the cycle of memory (*smrti*) and the memory traces or reactive momentum that drives action (*samskara*).

In the Samkhya system adopted and modified in tantra, there is a cycle of evolutionary and involutionary processes by which the material world (*prakrti*) and the spiritual or ultimate causal world (*purusa* or Siva) interact (Larson, 1969). In the tantric version of this account, the evolutionary phase of the cycle is the one in which the world and thus the mind emanate directly from Siva (Muller-Ortega, 1992). This is the emanation theory discussed in chapter four in which in the evolutionary phase the elements of the cosmos emanate from the subtler forms. In this theory, the *gunas* (especially *rajas* and *tamas*) bind matter, therefore they bind the *citta* of each individual *purusa* (consciousness) and generate *cittavrtti* (mental processes), including *smrti* (memory) and *samskaras* (memory traces). What we consider here is the yogic proposition that the variable influence of each *guna* (binding force) leads to the expression of different qualities in the mind. For example, as discussed in chapter four, the binding of tamas generates the qualities of lethargy and dullness and rajas gernerates activity, while *sattva guna* generates the qualities of sentience and radiance.

Anandamurti (1962; Anandamitra, 1981) explains that before evolutionary processes commence, however, the three *gunic* forces (the binding forces of *tamas*, *rajas*, and *sattva*) form a "triangle" in which all the three forces balance each other, thereby creating one single vibration in the cosmos. Muller Ortega (1992) echoes this idea, explaining that before the beginning there was not silence but a "perfectly coherent and self-contained vibration (*spanda*), one in which the various waves coherently and implicitly cancel each other out." Anandamurti elucidates that this harmony between the three *gunas* and consequent vibration creates a centripetal and centrifugal spiritual force that attracts the mind to Brahma, the composite of Siva and Sakti, the spiritual center of the cosmos (Anandamurti, 1962). This attraction process underlies the purification of the mind from its impure qualities be reestablishing the balance between the three *gunas*. Thus the balance between the *gunas* is what creates the cosmic vibration (*spanda*) that is the goal of yoga. In this state, there is no mental activity in the sense of perturbances or *cittavrtti* because the mind (and the entire world) is absorbed into the same cosmic vibration.

An axiom of tantric theory is that fluctuation in the cosmic vibration - the oscillation of Brahma (or Siva) - from a state of equilibration through the evolutionary process results in cognitive activity. Specifically, psychological experience of worldly perception and cognition is theorized in terms of those moments when the coherent triangle becomes disequilibriated and *gunic* forces generate what we call mental phenomena. Muller-Ortega (1992) explains that in the moments when the *gunas* become disequilibrated, the disequilibration of the *guna*s generates phonemes: eventually the evolutionary process of Siva manifesting in the world unfolds onto the plane of ordinary

embodied language rooted in phonemes. Muller-Ortega goes on to explain that when the *gunic* equilibrium is disturbed, the phonemes become arranged such that they create patterns in the fabric of the cosmos that interfere with the unbroken and undisturbed vibration of Siva. The coagulation or thickening of realities around the interference patterns of phonemes sets up separate cognitions that will give rise to the phenomenonal universe of everyday experience. Along these lines, Chapple (1982) views cognitions as ripples: a state of awareness is actually cognition of areas of patterned experience. Moreover, these cognitions are attentional moments that get stored as memory traces.

In this theory, phonemes are linked with the *tattvas*, or the elements of the universe that, as we have seen in previous chapters, play a central role in the purification practices of *ishvara pranidhana*. Phonemes along with *tattvas* are postulated as areas of patterned disturbance that yield emotional experiences and memories that are all dissolved during meditation (Muller-Ortega, 1992) as the *kundalini* rises up through the *cittavrtti*s embedded in each *chakra*, piercing and purifying each along the way. Note that just as in Samkhya, tantra theorizes that the world's elements (i.e., *tattvas*) include all the psychological structures of awareness of the individual. Within limited areas of the cosmos (that is, each individual body), the phonemes are conceived as embodied in the practitioner, and by extension, cognitions are thus also formulated as embedded in the practitioner (explained further in the next section on emotion and absorption). Symbolically ordered *saktis* (or energies) create the patterns that result in the specific cognitions of apparently separate and finite objects, with *kundalini sakti* as the highest ordered embodied *sakti* within a human *purusa* (consciousness) or being (White, 1996). In this way, attentional moments get stored as phonemes in the body. More will be said

about the existence and structure of the phonemes in the body later in the mechanisms of emotion section.

From this theorized evolutionary process, we can infer that the realm of the disequilibration between the binding forces in which one can dominate the others is the "mental" level, and where memory operates in the normal sense. Memory is recalled or called to present moment awareness depending on the flux of *gunic* forces. From this perspective, memory is therefore both a cosmological and psychological process. In this theory, objects themselves are cognitions because the matter that constitutes any object is imagined as nothing more than areas of fluctuation within cosmic reality. Perception is thus a process in which the infinite consciousness encounters its own interference patterns and takes cognizance of them (Muller-Ortega, 1992). Thus knowable objects, in their essence, are nothing more than the absolute consciousness.

The difference between objects and consciousness (or spirit, *purusa*) is that objects which appear to be solid and separate in reality are discrete areas of patterning set up by the internal interferences of the *saktis* and the disequilibrated influence of the *guna*s (binding forces). By contrast, absolute consciousness is unbounded and unconstrained by patterns of any sort. This reality can get stored as a memory, too: a moment of remembrance. The goal of yoga is for the mind to achieve this remembrance and become absorbed in absolute consciousness. Muller-Ortega (1992) explains that meditation coheres around the reversal of the cosmogonic act: what was described above as the emanation of phonemes and worldly events. The withdrawal of the mind (*citta*) from the elements (*tattvas*) and from the phonemes and subtler emanations in the world through purification processes of *ishvara pranidhana* that we have been examining is this

reversal. Yogic withdrawal and the reversal of *samskaric* memory processes occur through the mechanistic changes in the equilibration of the *guna*s. We will examine the unfolding of this process in the body more closely in the next section on absorption. Here I conclude this analysis of binding as the mechanism of memory by recapitulating that tantric yoga advances an interpretation of the cosmic cycles in which, through yogic practice, the *gunas* lose influence over the activity of the mind. In this state, the equilibrium of the binding forces is reestablished and therefore no mental activity occurs (at least in the normal modes of mental fluctuations (*cittavrtti*)).

Yogic theory holds that the binding mechanisms of the *guna*s (binding forces) operate on a cosmic level; operations on this level create and influence mental processes within human minds. The process of sublimation during meditation purportedly unbinds the *citta* from the influences of the *gunic* forces.

Even when the sensory mind becomes quiet (such as during meditation or sleep), the mind can still be active with memories (both memory and stored *samskaras*) and thoughts about the future (*manomaya kosa*). Therefore, during meditation, after the yogin internalizes mental focus and begins purification of the *kosas*, conscious dissolution of the mind's habituated mental-emotional patterns begins. This is done through a yogic process of sublimation, in which the meditator "applies" the mantra to unwanted distracting mental content (thoughts, memories, emotions, etc.). By continuously rehearsing the mantra with conscious awareness of this rehearsal process, the meditator is able to sublimate or "quiet" this deeper, often subconscious and unconscious, activity of the mind.

The process of *citta suddhi* (purification of the mind) is associated with the movement of the meditator's consciousness through the deeper *kosas* (layers of the mind). Anandamurti (Sarkar, 1959) explains that the mind becomes clearer as lower *kosas* (conscious sensory mind and subconscious memory) merge into subtler higher layers (intuitive higher layers of mind). Through the force of mental attention and concentration on one's innermost layer (the *Atman*), the *sattvik* force comes to dominate the mind as consciousness moves through the layers and becomes absorbed in the superconscious *Atman*. This movement of consciousness into deeper layers of mind purifies one even more deeply and frees the mind for original – that is, non-habituated – action. To progress through these layers, consciousness must become free from the *gunas*, the "*prakrtic* bonds" of matter or substance that tie it to the phenomenal world (Feuerstein, 1979). These *gunas* (binding forces) are the ground forces of the mental layers and through meditation these bonds are broken.

Breaking these deep bonds is one of the main transformation processes of sublimation that occurs during yoga. The "*sattva*tization" of the mind occurs when the mind becomes free from its stagnant and active habituations that keep it from experiencing oneness with *purusa* (spirit or consciousness). For example, the mind is stagnant and bound by *tamas* when in a state of depression and the mind cannot pull itself away from thinking in a particular pattern. These habituations play a central role in shaping present experience, since they express themselves in thoughts and actions (Feuerstein, 1998).

According to yogic theory, the store of subliminal impressions or *samskaras* is obliterated only when the chain of causal relations is broken (Feuerstein, 1979; Whicher,

2005). Anandamurti (Sarkar, 1959; Anandamurti, 1962) emphasizes the aspect of this theory that views *samskaras* as reactions and in terms of in their potentiality. In other words, he claims that when an action has taken place but the reaction has not yet occurred, the reaction to the action remains in a seed form, which is *samskara*. Thus in Anandamurti's terms, *samskaras* are 'reactive momenta.' In this theory, *samskaras* are collectively stored in a deep layer of the causal mind and extinguished through yogic practices such as Anandamurti's *ishvara pranidhana* meditation. Extinguishing is thought to involve the reactive momenta being dissolved by subliminating each *samskara* to the mantra. In this way, it is believed that by purging the mind from its stored reactive momenta, the mind moves closer to the state of *nirodha* (cessation). In this state of *nirodha*, the deep effects of mantra recitation on the idea of Brahma are thought to set in.

In *ishvara pranidhana*, practitioners sublimate all the thoughts and emotions, all the mental content, with *ishvara* or *Parama Purusa* (god or cosmic consciousness). Anandamurti asserts that sublimation is able to occur during *ishvara pranidhana* through the use of mantra because god is the singular idea contained within the phonemes of the mantra. In other words, the technique of *ishvara pranidhana* is thought to work with the use of mantra because of the reality of god is theorized in terms of the oscillating nature of the phoneme structure. Later we will elaborate on the idea of mantra itself as a mechanism of the mind during meditation, but here we will stay focused on understanding sublimation. Any time a thought arises, the meditator simply continues to direct attention to the mantra, to its recitation and to the feeling that arises in association with the meaning of the mantra. In this way, with sustained concentrated attention to the mantra, the reactive momentum (*samskaras*) and contents of the thoughts and emotions

that arise in the mind become associated with the feeling generated by mantra recitation. Each *samskara* comes to "ripen" or express itself, rather than continuing to drive new thoughts as reactions. This is sublimation during *ishvara pranidhana*, and this act of sublimation effectively extinguishes the reactive momentum of *samskara*; it no longer drives the cycle of action.

Yet one must be in a certain state to be able to achieve sublimation within the deep layers of the mind. "It is only when you achieve the act of witnessing that the process of purging the *samskaras* begins, and the energy force of the emotions is channeled creatively to arouse an inner experience" (Swami Satyananda, 1968). Anandamurti (Sarkar, 1959) explains how one overcomes *samskara* by "transcending the inertness of [one's own] mind" during yogic practice:

> What we generally call the causal or unconscious mind is also a blending of the three attributes, *sattva*, *rajas*, and *tamas*, which are part of the *citta*…. It is for this reason that the seeds of the reactive momenta (sam'ska'ras) are stored in the causal mind. In order to fully visualize the unconscious mind or causal mind, one's identity must remain unaffected from its … [stored and habituated] … sam'ska'ras. With the expression of the sam'ska'ras the crude and subtle minds get agitated and it becomes impossible for the sam'ska'ra-laden … [meditator]… to reach the stage of tranquility of the causal mind. [Thus] … in order to know or comprehend the causal mind one must transcend the inertness of the mind. At this stage the Ahamtattva (doer-I) [ego] is bound to merge in [the meditator's] mahatattva (existential-I). In that event the … [meditator's] … mahatattva ("I am-ness") will then have no alternative but to temporarily identify itself with the [cosmic existence] (pp. 33-34).

Anandamurti is saying is that the unconscious mind is really a blending of the qualities of all three *guna*s, which are all a part of *citta*. The seeds of the reactive momenta or *samskara* are stored in this aspect or layer of mind. When consciously reflecting on and visualizing this layer of mind, a person must not allow the stored *samskaras* to affect

one's identity; this effort requires that the meditator overcome or purify the inertness and other *gunic* qualities of the mind. When the influence of the *guna*'s qualities on the mind has been overcome, the meditator's mind merges into higher identifications and then temporarily identifies with Siva's cosmic existence. This quote emphasizes that the *samskaras* agitate the mind, and that one must try to not let one's identity be affected by *samskara*. This requires merging the mind into *Atman*, Brahman, or *ishvara* so that it can attain quiet. Identifying each thought with the mantra is thought to foster the cognitive "shift" in identification away from the ego identity towards an existing "I" feeling. The core transformation process of *ishvara pranidhana* is sublimating these *samskaras* or memory traces. One witnesses mental processes bubbling up and then subsiding as one identifies the mental content with Brahman. Continuously directing the mind towards Siva, Brahman, or *ishvara*, that all express god or ultimate reality, maintains this success, for attachment to the phenomenal world is the root of mental imbalance (Whicher, 1997; Feuerstein, 1998).

But one must learn to properly use a mantra to be able to successfully sublimate the unwanted mental content. Several scholars argue for the view of mantra as learned action. Coward (1989), for example, says that Fritz Staal argued that there is a direct relationship between ritual actions and mantras. Wheelock (1989) also points to mantra as ritual action. Alper (1989) shows support for believing that a social process is involved in learning mantric ritual utterance. Adepts necessarily learn and implicitly accept social rules and beliefs about mantra when they learn and then adopt mantric ritual as personal practice. Therefore, putting mantra into play to sublimate the mind is content and rule dependent, and requires properly learning the action.

Thus, the process of meditation brings the emotional turbulence brought about by the five forces of corruption (*klesha*s) under control by holding this single thought: sublimating all other thoughts to this single thought stills the fluctuations of the *klesha*s (ignorance, ego, attachment, aversion, and will to live) so that they no longer activate any of the five modes. But sublimation also rids the deep memory (the "seeds" of *samskara*) of its past impressions. It transforms memories, cognitions, and emotions by channeling them towards god.

Here I have presented mantra and visualization as tantric yoga processes of learned actions that change *samskaras* (memory traces), and thus enable entrance into absorption. Thus we have arrived at the view that learning these techniques offers the "how to" by which one alters learned habits. The *guna*s or binding forces have been identified as the primary mechanisms theorized in tantric transformation processes, with sublimation during *ishvara pranidhana* as an aspect of the process that transforms the mechanistic operations of the *guna*s. These processes are important because, as we will elaborate in the next section, they play a central role in tantric theories about how meditation ultimately changes an individual's self-identity.

Neuroscience: Memory Mechanisms

There are many detailed mechanisms of memory discussed in the neuroscience literature on memory. I focus on one overarching mechanism of memory: binding. Hebb (1949) proposed binding as a cellular and neural network mechanism for learning that involves the transfer of short-term memory into long-term memory, and this model has become the dominant view of neural bases of memory formation (e.g., Goelet,

Castellucci, Schacher, and Kandel, 1986; Axmacher, Mormann, Fernandez, Elger, and Fell, 2006). One can see at least four main memory processes based on the mechanism of binding that commit episodic and semantic knowledge to long-term memory, all of which, I believe, must be involved in stages of meditation (because they are involved in all learning processes): encoding, consolidation, storage, and retrieval (Gazzaniga, Ivry, and Mansun, 1998). These processes constitute the phases requiring the mechanical operations of cellular and network binding.

Learning requires acquiring and storing new information – the functions of encoding - which is the first phase of cellular binding. During the process of encoding, independent features of perception somehow become bound together into a unified conscious experience. The "binding problem" is the theoretical and scientific problem of explaining the explicit association between features of objects of perception (von der Malsburg, 1999; Roskies, 1999). For example, colors and shapes, as well as words, are each encoded within different areas of the brain. How does a person recognize the blue, rectangular object as a table?

One aspect of binding is temporal binding where events co-occurring in time are more likely to be bound and this has been linked with increased firing of neuronal populations (von der Malsburg, 1999; Triesman, 1996, 1999; Ward, 2003), especially when the firing is synchronous. Synchronized temporal binding occurs at multiple levels from the level of individual neurons to the systems level in different regions of the brain when neuronal activity is temporally linked. Increased neuronal activity is evidence of synchronous activity over large numbers of neurons (Ward, 2003; Buzsaki and Draguhn, 2004).

The process of learning is thought to change the neural activity of circuits normally mediating whatever behavior is to be changed (e.g., the perceptions, actions, feelings, thoughts, etc.) (Axmacher, Mormann, Fernandez, Elger, and Fell, 2006). The learning is accomplished by having sufficient change in neural activation of connections between neurons, e.g., in more specific terms, a population of presynaptic connections fire in a manner that increases activation of postsynaptic neurons. The learning encoding process is thought to result from a change in firing patterns, e.g., increased firing frequency of specific inputs and synchrony across the inputs (Butz, Worgotter, and van Ooyen, 2009). If the activation across this population of synapses is sufficient, it instigates the synaptic plasticity cascade that result in the creation of memory (Axmacher, Mormann, Fernandez, Elger, and Fell, 2006). The potency of the postsynaptic activation is enhanced when the presynaptic neurons *fire together*, that is, at the same time, synchronously (Butz et al., 2009). Synchrony strengthens the synapses in the hippocampus (Bontempi et al., 1999), and from this evidence it is thought that this synaptic plasticity from synchronous firing could likely be widespread through out the brain.

Synchrony works best when the neuronal firing of the population that is synchronous with the population and with theta oscillations (Buzaki, 2006). Gamma oscillation is thought to reflect the experience-driven activity: the firing. Thus, the synchronization of fast wave gamma and the slow wave theta oscillations helps it achieve the postsynaptic activation needed to instigate plasticity (Buzsaki and Draguhn, 2004). This is not equal to theta oscillations being the mechanisms, though, because it is not the oscillations per se that creates memories – these are happening all the time and probably

reflect memory formation and many other processes. The reason that synchrony is such an important mechanism, then, is that because of synchronous activity in the brain, experience becomes encoded via neuronal-activity-dependent plasticity (Butz, Worgotter, and van Ooyen, 2009). More simply, synchrony makes it easier to get to the sufficient activation needed to instigate the plasticity.

Shifting attention has been found to modulate synchronous neural firing (Fries et al., 2001) and sufficiently increased neuronal firing can induce synaptic plasticity (Traub et al., 1998), especially if synchronous with theta oscillations during working memory and memory formation (Axmacher, Mormann, Fernandez, Elger, and Fell, 2006). In this way oscillations are not only related to the experiential aspects of cognition, but can also help change the structure of the brain. As discussed earlier, attention is an important aspect of working memory, and evidence has accumulated showing oscillatory neural activity during attention and conscious states, which oscillate around 40Hz (in the gamma range) (Engel and Singer, 2001). Tallon-Baudry et al. (2001) found evidence that synchronized oscillatory activity occurs during object rehearsal in visual short term memory. This finding could be important to understanding *ishvara pranidhana* since the meditator rehearses the visualization of an abstract image of oneself becoming one with god during meditation.

After encoding, the brain "stabilizes" this new information through consolidation processes (Debiec, LeDoux, and Nader, 2002). At the cellular level, new protein synthesis results from the temporary changes i.e., in synaptic activity, and this results in persistent modifications of synaptic potency and architecture (Goelet, Castellucci, Schacher, and Kandel, 1986; Debiec, LeDoux, and Nader, 2002). This culminates in a

lasting change in the strengths of synapses in relevant neuronal circuits and this is thought to be the long-term memory.

A growing body of evidence supports the idea that sleep plays an important role in memory formation and functioning by consolidating memories through the mechanism of oscillatory neural synchrony (Buzsaki and Draguhan, 2004; Axmacher et al., 2006). Recent neuronal firing patterns present during learning have been found to be "replayed" during sleep, and this replay is thought to stabilize the synaptic strengthening of the network. In addition, thalamo-cortical oscillations synchronize the brain during sleep in a way to reduce environmental influences on neocortical activity, thereby actively shifting sleep into deeper stages (Steriade, McCormick, and Sejnowski, 1993). This activity is thought to be how sleep supports memory consolidation and participates in changing the physical structure of the brain. The memory function of sleep may not be just about consolidation, but also about filtering, clearing, or correcting the "noise" of irrelevant circuits.

Although different in important ways, meditation has similarities to sleep. For example, as discussed in chapter three, alpha and theta bands recorded during several types of meditation, including *ishvara pranidhana*, closely resemble those of sleep (e.g., Elson, Hauri, and Cunis, 1977). At one time, researchers wondered whether the alpha and theta bands during meditation reflected sleep, although now the two are generally recognized as distinct states. Theta and gamma are the most typical phases during sleep. Both meditation and sleep share the feature that the brain's responsiveness to external stimuli progressively decreases. Experimental studies have shown that both sleep (Moroni et al., 2008) and at least one type of compassion meditation (Lutz et al., 2004)

exhibit synchronous gamma oscillations. Another commonality is that there is evidence that both sleep (e.g., Rauchs, Desgranges, Foret, and Eustache, 2005) and meditation (e.g., Fabbro, Muzur, Bellen, Calacione, and Bava, 1999) improve memory. For example, perhaps meditation is necessary for the formation of one particular kind of remembrance: one's relationship with reality. Perhaps meditation performs a similar role as sleep in clearing or filtering irrelevant circuits from memory processes. Because of the commonalities between sleep and meditation and their relation to memory, meditation could have a similar role in the formation and functioning of memory.

Consolidation is the memory process that stores the formed memory traces. The hippocampus has been shown to have a time-limited role in memory storage, such that after a period, the memory trace exists independently of the hippocampus (Zola-Morgan and Squire, 1990). This "unbinding" of a memory trace from the hippocampus may mark the end of consolidation process (Bontempi, Laurent-Demir, Destrade, and Jaffard, 1999). The memories persist or endure through cortical and subcortical connections. Because all experience is imprinted in the brain, we should be able to assume that the meditation feeling and states of consciousness undergo these processes of encoding and cellular binding, and are consolidated into long-term memory stores as well.

Though consolidation represents memory stabilization, it does not indicate unchanging performance. A study by Lewis and colleagues (1968) challenged the long-held view that consolidated memories persist unchanged over time, instead suggesting that retrieval, a process of reactivating Misanin, Miller, and Lewis consolidated memories, returns the memory trace to a "labile" state, and that reactivation (or retrieval) initiates a second consolidation process. This second process is now established in

memory research literature as reconsolidation (e.g., Przbyslawski and Sara, 1997; Nader, 2003).

Reactivation draws established memory traces from both the hippocampus and neocortex into working memory (Debiec, LeDoux, and Nader, 2002), where memory can be operated on and manipulated. Sara explains that "original" memories are always stored within the context of a "memory network;" i.e., by retrieval of past experience. Each time a memory is retrieved, the brain reorganizes the trace by integrating new information from the current environmental context with the recalled information, and then stored again within the existing memory network (Przybyslawski and Sara, 1997). In this way, memory and experience reciprocally affect one another, and memory "colors" present-tense experience (Nader, 2003). Like LTM consolidation, reconsolidation depends on protein synthesis and both have time windows within which to operate (Debiec et al., 2002), with growing evidence that reconsolidation also requires transcription (Nader, 2003). Reconsolidation is different from consolidation, though, because different stimuli are presented to trigger consolidation of the learning event; a reinforcer is present during consolidation but not present for reconsolidation (Nader, 2003). Thus, because of less cellular processing, reconsolidation is faster than consolidation (Nader, 2003).

Retrieval occurs when the central executive (attentional system) of working memory, located in the frontal areas (Baddeley, 2003) recruits different information broadly from different cortical and subcortical circuits, depending on what type of information is needed for retrieval (Debiec, LeDoux, and Nader, 2002). The hippocampus and frontal cortex are the brain structures most commonly implicated in

retrieval processes (Sara 2000). Thus, as with other memory processes, different brain systems subserve retrieval of implicit and explicit information. (For further reading on retrieval processes see, for example, Anderson, 1983; Cowan, 1995; Ruchkin et al. 2003.)

Retrieval could be important for understanding meditation because attentional and working memory systems draw from long-term memory to form imagery, and imagery is used during *ishvara pranidhana*. In one view, working memory is believed to draw from or "retrieve" long-term memory stores to form imagery by reactivating cortical structures that were activated when these representations were initially encoded (Denis, Mellet, and Kosslyn, 2004). In this way, mental imagery is a way to have the experience of an object in the absence of actual physical sensory input (Kosslyn, 2005).

Baddeley (2000) cites conscious awareness as the mechanism of retrieval from the episodic buffer, his theorized working memory system that holds temporary stores of unitary episodic representations. Although conscious awareness might mean something different in tantra and not a narrow definition of some kind of attention, there could be a similarity between the conscious awareness of retrieval and the kind of conscious awareness during the visualization phase of meditation. Because one aims to achieve continuous conscious awareness during the phase of meditation in which one concentrates on the visualization, mechanisms of mental imagery such as conscious awareness in response to conditioned cues might explain mechanistic processes that occur in the brain during meditation and the way that meditation impacts memory.

A further point is that retrieval initiates two separate but potentially opposite processes of reconsolidation and extinction (Suzuki et al., 2004). Reconsolidation is a process that links memory retrieval to experience-dependent neuroplasticity, that is, this

process changes past memories rather than just forming new ones by "redoing" intracellular memory consolidation events (Przybyslawski and Sara, 1997).

In addition to initiating the memory reconsolidation process, retrieval can also initiate a similar process of extinction (Suzuki et al., 2004). Extinction involves the unpairing of conditioned stimulus with unconditioned stimulus during retrieval phase (Meyers and Davis, 2002). Extinction is a protein synthesis dependent memory state and has some of the same cellular and molecular mechanisms of both consolidation and reconsolidation (Debiec et al., 2002, Nader, 2003). However, whereas reconsolidation requires just a brief reminder of the cue for recall, the subject needs to be exposed to the contextual cue for a longer period to initiate extinction processes (Debiec et al., 2002; Eisenberg, 2003).

Santini, Muller, and Quirk (2001) showed that extinction consolidation involves the transfer from NMDA-independent to NMDA-dependent memory and dopamine, GABA, and protein synthesis are examples of other biochemical systems involved in extinction (see Meyers and Davis (2002) for review). There is some evidence that imagery might function in extinction in the same way as an actual presented stimulus. Dadds, Bovbjerg, Redd, and Cutmore (1997) reviewed empirical evidence to explain in detail the role of mental images of conditioned stimuli and unconditioned stimuli during pre-exposure to stimuli – the actual pairing of the conditioned stimulus unconditioned stimulus – and extinction when the conditioned stimulus was presented alone. The authors concluded that the evidence suggests that mental imagery can facilitate or diminish the outcome of classical conditioning in humans and, more tentatively, that mental images can substitute for actual conditioned stimuli and unconditioned stimuli in

autonomic conditioning. These findings are relevant to meditation if mantra and visualization become conditioned stimuli. See Dadds et al. (1997) for a discussion and review of imagery literature.

In sum, information central to memories is constantly being retrieved and shapes in-the-moment perceptions. Old memories are also constantly being modified and reformulated based on new experiences, and sometimes old stores are dissolved (extinguished). These memory processes are embodied at the cellular level through biochemical changes and at the systems level when the activity is synchronized throughout networks. Because meditation has been shown to enhance effects of both short-term (or working memory) and long term memory, there is reason to believe that retrieval and change processes of memory are involved in meditation.

Comparison: Liberative *Samskaras* and Reconsolidation of Retrieved Memories

This comparison concerns the memory mechanisms involved in the processes of how we develop knowledge from in-the-moment perception, with a special focus on change as these processes operate during meditation. These processes involve learning and memory; on the most basic level, both neuroscience and tantric yoga locate memory in the body. As has been discussed, neuroscience associates structures such as the hippocampus and cortex with consolidation processes necessary for forming long-term memory and areas of the prefrontal cortex with attentional processes necessary for generating working memory. Yoga locates memory in the body, too, since yoga identifies memory as a *cittavrtti* that operates within the person and *cittavrtti* is part of the material structure of the universe. The theme of comparing models of the body recognized in

tantric yoga and neuroscience thus begins here in this section on memory mechanisms; however, later sections on emotion elaborate on this comparison and go into more detail on the point of how *cittavrttis*, and *samskaras*, too, are theorized in the body.

Explaining conscious states requires explaining binding information across multiple interacting systems. *Ishvara pranidhana* involves associating the mantra, which is continuously held in conscious awareness, with all previous memories and past as well as present-moment emotions.

Both systems also suggest "binding" as a primary mechanism of memory, and this seems to be the most important comparison point. Through the action of oscillatory neural synchrony at multiple levels in the neuroscience view, the mechanism of binding changes the physical structure of the cell and network connectivity, and instantiates new and reshapes old memories in the brain. In tantric yoga, theorized shifts in the balance and dominance of the three cosmic binding forces or *gunas*, that operate on all matter and directly influence the emergence of differing mental qualities, create different kinds of impressions or memories (*samskaras* and *smrti*s) in the mind. Neuroscience binding operates only in the brain and specifically on cellular processes, and tantric yoga binding is theorized as driving material transformations both throughout the cosmos as well as at individual levels of the mind (such as, in theory, the brain). Despite this difference, the binding mechanism a basic homologous similarity in their memory processes. The activity dependent binding that operates in the brain in response to environmental cues, and its dependence on oscillating synchronous activity, might suggest some broader binding forces, possibly akin to the yogic *guna*s. Yet the difference in focus of analytical level makes a comparison beyond the general concept of "binding" difficult.

Since the *gunas* are postulated as operating within the person and existing as forces within the realm of matter (*prakrti*), we might infer that they also operate, in theory, within the brain and influence its processes. Of course, traditional texts offer nothing on this matter; they do not discuss or mention the brain at all in reference to any aspect of the yogic theories of mental processes. Because the *gunas* have psychological qualities to them, it may also be reasonable to think that they compare with operations that influence the brain's processes in light of the neuroscience view that neurophysiological processes create mental functioning. Along these lines, the facts about different structures of the brain being associated with different kinds and stages of memory (such as long-term memory stores vs. short term working memory) suggests some similarity with Anandamurti's teaching about *samskaras* being stored in certain *kosas* (layers of the mind) in that yoga presents different layers of mind associated with different mental functions.

We might also compare the tantric yoga processes of binding and liberation with the neuroscience processes of cellular binding and gaining knowledge in terms of psychological processes relevant to meditation. For example, when the mind is bound by *tamas guna*, the mind is said to have a lethargic tendency and quality of dullness. These are the qualities that people use to define depression, and depression is thought to be associated with low levels of activation in the prefrontal cortex, etc. (Henriques and Davidson, 1991; Abercrombie, 1998) In contrast, when the mind is dominated by the sattvic quality, as theorized during meditation, it has a sentient quality that suggests wakefulness, attentiveness, and calm alertness. In neuroscience, these qualities are associated with activation in the prefrontal areas. The brain seems to exhibit some similar

qualities attributed to the *gunas*, such as the quality of "activity" (*rajas guna*) when there is increased bloodflow and chemical activity in certain regions over others, or the quality of "inertia" (*tamas guna*) when a given brain area has been structurally injured and no longer working or somehow otherwise inactive.

One observation that seems especially relevant to this comparison is that recent neuroscience literature has proposed a mechanism of theta binding across the brain as a "global" mechanism, because this principle seems more suggestive of the yogic concept of binding "forces" that act across the brain rather than just in localized areas within cells. Further analyses are needed to compare how or if the cosmic mechanisms posited in tantric yoga operate in connection with the localized substance of an individual brain, but this topic extends into the areas of cosmology and potentially into physics.

An additional commonality is that both systems suggest a cyclical, mechanical, or driving relationship between memory and experience. In yoga, the cyclical causality between *samskara* and *smrti* operates mechanically in the mind (in the same way that *samskara* exhibits cyclical causality with other mental processes such as valid cognition (*pramana*)) such that the deep stores of *samskara* (subliminal activators) catalyze actions and then the experience generated from such actions becomes contained in the form of new memory traces, which then also create subliminal activators, and so on. In neuroscience, the brain forms new impressions through memory encoding processes that retrieve memory traces from memory stores and integrate these with present-tense experience to form current impressions, and similarly cycles. Moreover, in both systems action can be generated internally, as opposed to externally-driven activity via

environmental stimuli. So, although the two systems describe memory mechanisms on different levels, descriptions on all the levels underscore this basic mechanical principle.

Both systems describe a process of associating present moment percepts with stored mental content as a way of both interpreting current experiences and also changing memory stores. In sublimation from the tantric yoga perspective, the meditator seeks to dissolve mental content and transform emotionally distressing states of mind into either peacefully calm or joyfully ecstatic emotional states by associating distressing content with the mantra. By focusing on repeating the mantra while contemplating the meaning of the mantra and continuously attending to the visualization, the meditator consciously directs attention towards the cultivation of peaceful as opposed to distressed states. In this way, sublimation is a psychological process. Similarly, from the neuroscience perspective, incoming information that represents present-moment perceptions is associated with recalled information from both short and long-term memory stores. These associations help a person assign meaning to perceived stimuli and events, and this includes reshaping memory stores.

Along these lines, I found that both systems convey the notion of change. The change processes of sublimation in tantric yoga and plasticity (and its processes of consolidation, reconsolidation and extinction) in neuroscience are similar conceptually in that both evoke a notion of change. But the tantric yoga process of sublimation has a clear intentional goal for the direction of change (that is, intentionally directing the mind towards Siva) whereas plasticity occurs for positive adaptive changes as well as the learning of "bad" habits. We have seen that in neuroscience, cellular binding and retrieval processes of reconsolidation and extinction lead to plastic changes in the

physical structure of the brain. The physical structure of the person is also thought to change with experience as viewed from the tantric yoga binding processes.

A major difference between the two systems' accounts of memory processes is that, because the tantric yoga theorizing does link physical processes of the body to cosmic structures, this account provides meaningful interpretations. In the tantric yoga view, the physical structure of the person is constituted at the most basic level in terms of phonemes and *tattvas* and, as described above, changes in the domination of the *gunic* forces cause transformations of this fundamental structure. Putting aside for the moment the question of whether these structures actually exist and instead focusing on how they are thought to function within the tantric yoga system, I found that the processes of the *gunic* forces causing perturbances in the fabric of the reality, interpreted as cognition, seems to be a more basic and psychologically meaningful explanation of mental states. The theorized tantric yoga structures, albeit metaphysical structures, seem to be at a more basic level of reality in the same way that chemical processes explain biological phenomenon or physical descriptions of reality explain chemical processes. However, the neuroscience view of activation of neuronal cells and neurophysiological systems is not meant to provide meaning in this sense, but rather mechanisms.

Even if one did consider the ontological status of these theorized structures, I am not sure that these are theorized in the same dimension because the neuroscience structures of cells are complex biological entities and seem to be in a more condensed state than the structures in tantric yoga. More directly to the point, the substance of the tantric yoga structures seems to be imbued with consciousness as opposed to existing in the same form of brute matter of neuroscience cells and neurotransmitters. This matters in

terms of functionality because the fluctuation and movement of the phonemes and influence of the *tattvas* itself can be interpreted in terms of changes in cognitive perceptions, whereas another level of explanation is still needed to understand mental processes such as memory when one considers changes in the activation of the brain structures. The problem with this view from a scientific perspective is that there is no way to observe and measure these proposed structures; therefore, it is difficult to advance a scientific hypothesis that a) either these structures exist or b) changes in these structures are associated with or embody mental phenomena such as memory and cognition either during meditation or in any normal waking state.

3. Overall Comparison and Implications

We also must consider that the language differs dramatically between the systems, and that this difference has some broader implications for understanding absorption. For example, "cellular" and "*gunas*" (translated as forces) can be thought of as central forces in memory in these systems. While the adjective "cellular" indicates actual physical processes, the (translated) yogic notion of "forces" is indistinct since it is not itself physical. This sort of difference matters for understanding higher-level psychological processes. In the modern tantric view, for example, consciousness is understood to be located within every cell (e.g., Swami Satyananda, 1984); however, consciousness is not yet understood from the neuroscience perspective and the idea that consciousness is in every cell seems incomprehensible, given that mental functions are thought to be associated with combinations of local and global activation of specific structures and widespread circuits rather than any sort of "activity" within any single cell. This basic

difference of conceiving binding in terms of its material processes versus underlying forces reflects deeper differences in views of causality embedded in each system's theory of mind. Whereas neuroscience focuses on an efficient material cause-effect type of explanation, the tantric yoga explanation indicates other types of causality, especially the final causality in which the divine source of the *gunas* as Siva is the primary cause of memory and *samskara*.

However, perceptions and cognitions of the world, shaped by memory, necessitate that the mind deals with meanings, sense, and values. In tantric yoga, the binding principles essentially carry a subjective quality to individual experience; however, material structures of cellular processes do not. In neuroscience, content and meaning are perceived and shaped by saliency, attention, and emotional valence to encode stimuli from the environment (though the environment could be the mental context). Thus, at this theoretical level one can see a further similarity between neuroscience and tantric yoga in that both take the environmental context into account to explain what needs to happen to put memories together. But in neuroscience, the space within which all these memory processes occur is contained within the well- defined structure of the brain in the individual person. This condition greatly differs from the yogic concept of binding, since the *gunas* operate not just in the mind, but are cosmic principles. For both, though, the individual is understood to be organically and fundamentally interactive within the environmental context and the person's experiences are had because of this interaction. This self-environment relationship suggests the need for some (further) exploration of theories of energy transfer between the two systems to explicate this comparison.

In neuroscience, energy in various forms, such as light and sound, enters sensory organs and is chemically (light) and mechanically (sounds) transformed into neural signaling. These transformations within the sensory systems are well understood. Such transfer of energy indicates how the brain engages with the environment, suggesting that it relies on extended sensory organs to interface with the environment, gather information, and channel-selected information into processing centers. In this model, the transfer between the environment and the person is energy. Tantric yoga also has this idea that energy transfers between the person and the environment, but the tantric yoga cosmology that underpins this theory of energy transfer explains the interactions beyond a material and mechanical level of cause and effect. Tantric theory about the oscillating universe puts forward the notion that the person and the rest of the cosmos are more interconnected than the appearance of differentiated bodies suggests. This difference in ideas about interconnection between neuroscience and tantric yoga is at the heart of the differing epistemologies between the two systems.

We see the concept of synchronous oscillation at work in mechanical descriptions of memory function in the brain in the evidence of mechanistic theta binding across disparate areas of the brain, and chapter three discussed evidence of synchronized oscillation in the brain during meditation. We have also seen that there is an oscillating nature of the cellular activity during meditation. Because neuroscience advances explanations about neurophysiological processes, and not about what happens at the mental level, it might be impossible to determine whether this sort of relationship exists between mechanical explanations about memory from the two systems, except for the insight that the physical structure of the brain changes with experience. Therefore, two

implications of these comparisons between yogic and neuroscientific models of cognition memory and knowledge is that they challenge us to both examine what reality is depicted by each model and acknowledge our uncertainty about how it is that we come to know reality.

Chapter Eight

The Embodied Feeling of Meditative Absorption

Although we might not think of absorption as an emotion, per se, this sort of quality and the states of one's emotional experiences that come along with it, namely calmness, peacefulness, and even ecstatic blissfulness, are states associated with meditation that can be recognized as having emotional qualities. According to tantric yoga these states are all linked to the awareness that the individual "I" feeling has shifted away from a sense of a separate self identified with worldly realities and instead became absorbed in the cosmic entity (Feuerstein, 1979; Muller-Ortega, 1992). This chapter focuses on comparing tantric yoga and neurophysiological perspectives on these sorts of emotional states of meditation, especially regarding questions of where and how emotional qualities of meditative consciousness are embodied.

The Yoga Upanishads refer to the mind in terms of the concepts of *citta* (mind), *kosas* (sheaths of mind), *chakras* (energy centers), and *nadis* (energy channels), along with other concepts to indicate various domains of mind, but these concepts are discussed as existing in a subtle body that is distinct from the physical body. When referring to the physical body, Indian religious texts important to various understandings of yoga point to the gross level of organs, fluids, and tissues. References to the 'physical' body in yogic texts include entities such as 'heart,' 'navel,' and 'throat,' (Brown, 1921) but they do not refer to any cells or molecules, although cosmological theories make reference to atoms (*anu*). Tantric yoga theory also evokes the Samkhya-Yoga analysis of matter, whereby cosmic entities such as the elements (*tattvas*) of earth, fire, water, and air are all

simultaneously located within the physical body. These physical structures are all involved in absorption processes during meditation that result in emotional states.

Significantly, however, traditional yoga literature does not anywhere refer to the brain (Brown, 1921). Suggestions from scholars of Modern Yoga regarding translations that have occurred in the past decade especially between traditional forms of yoga and modern science (De Michelis, 2004; Alter, 2004; 2005) might lead one to wonder whether the trend for modern yoga teachers to discuss the role of the brain in yogic processes is a result of changes in modernity's influence over understandings of the brain.

Although there is a tradition of Western thought that goes at least as far back as Aristotle that maintains a body-based philosophy of emotions, the thinking for several hundred years during the Enlightenment Era in which dualism prevailed assumed that emotions are soul-based (Olson, 2004). As a key player in the progression of modernity, William James marked a shift in thinking about the emotions in Western thought that continues today when he (re)linked emotion to the body (Davidson, Jackson, and Kalin, 2000). James viewed emotions as "physiological response tendencies." In this view, emotions are instantiated in the body via physiological responses that engender certain tendencies. Along with this claim of body-based emotions was the notion that emotions have evolutionary significance; James advanced the idea that emotions function within situational contexts that motivate adaptive behavioral responses. Researchers today continue to draw on the James-Lange adaptive response-tendency perspective of emotions (for review, see Gross, 1998).

A second assertion within James' view was that there were no emotion circuits in the brain; however, this view came under major challenge from Cannon (1927/1987;

Davidson, Jackson, and Kalin, 2000). The issue here is that James thought of emotion more as a whole body phenomenon - an embodied emotion - whereas many have and still think that emotion is generated in the brain. Early views of the neural basis of emotion pointed to the limbic system as the center of emotion (e.g., Papez, 1937; Maclean, 1949, 1952; see Davidson et al., 2000 for discussion of these findings), but more recently evidence suggests that emotion circuits in the limbic system are widely connected with cortical areas (LeDoux, 1995). This evidence supports the view that people apply cognitive appraisals to interpret emotional feelings (see seminal articles by Schacter and Singer, 1962; Lazarus, 1984). However, cognitive views of the mind are challenged by attempts at more holistic understandings of the brain and mind, such as those perspectives arguing for an embodied understanding of emotion and mental phenomena (Valera, Thompson, Rosch, 2001).

Understanding the link between cognitive phenomena and emotional qualities of meditative states is a central question in understanding absorption in *ishvara pranidhana*, as it is in understanding any mystical phenomenon. Here in this chapter I examine tantric yoga and neuroscience views of emotion located in the body, focusing especially on emotion states involved in meditation states and the transformation of emotion during meditative processes. Because both systems hold that emotions of emotion is embodied, we focus, especially in the mechanisms section, on analyzing exactly what embodiment meant in each system.

1. Types of Emotion: Emotion Programs

In the following analysis, we examine the range of experience of emotion to discover what types of emotion are decribed by each system. The discussion focuses especially on the types of emotions involved in the processes of meditation. While both systems describe largely the same types of emotions, they also differ as to desriptions of the emotional quality of meditative states.

Tantric Yoga: Subtle Body Mechanisms of Emotional Expression

In chapter four the standard six-plus one model of the yogic subtle body was described. In this model, seven energy centers (*chakras*) are located within the nervous system and many more channels circulate energy throughout the body (Avalon, 1919/1974; White, 1996; 2000). Activity in this subtle body system is thought by tantric and hatha yoga traditions to generate emotional and mental flux. In this model, the *kundalini* rises through the central channel (*sushumna nadi*) when the other *nadis*, especially the *ida* and *pingala,* are balanced during states of absorption. This *chakra* model is one commonly used in tantric yoga traditions. But Anandamurti teaches something that I have not come across in any other literature. He claims that specific emotions – regular everyday emotions such as fear, anger, and joy – are associated with specific petals of the *chakras* (Sarkar, 1959; 1991).

According to Anandamurti (Sarkar, 1959; 1991; Ananda Mitra, 1981), each *chakra* (energy center) is surrounded by petals and these petals each reflect a particular type of *vrtti* or mental fluctuation. For example, Ananda Mitra (1981) writes that the psychological feeling of cruelty is associated with perturbations of a *vrtti* of the

svadhisthana chakra. So, when this *chakra* is vibrated or perturbed, the vibration results in a feeling of cruelty upon which one may or may not act. Thus, disturbing the *chakric* flows (and the flow of the *chakric* petals in particular) is what causes or creates the *cittavrtti* (mental perturbance) and the psychic experience associated with that particular *vrtti*. Further, these *vrttis* (perturbances), or petals of the *chakras* (energy centers), are located in the body just as the *chakras* are themselves associated with physical changes in the body. Thus, Anandamurti's psychological teaching links the yoga view of *vrtti* with the tantric notion of a subtle body such that mental fluctuations are tied into the tantric subtle body. The concept of *vrtti* takes on much more specific forms in this view than other *chakra* models and Classical Yoga teachings about *vrtti*s because in this view the material substance of the *cittavrtti* is specifically located around any given *chakra*. In other words, a specific *cittavrtti* manifests as an individual petal of a particular *chakra*.

These claims are an extension of claims asserted by Avalon (1919/1974). In his seminal scholarship on tantric yoga, Avalon writes extensively about correlations between tantric and neuroscientific physiological understandings. In these writings, Avalon claims that the "letters" of each *chakric* petal also exist in the *sahasrara chakra* (Anandamurti also makes this claim, as it is one aspect of the standard view of yoga). White (1996) also describes the letters or phonemic sounds of the Sanskrit alphabet situated on the petals of the *chakras* (energy centers). What is important about these energy centers, from Avalon's perspective, is that a) these centers are ascribed not only to the spinal centers but also exist in the cerebral centers and b) ultimately these cerebral centers (via their control of the spinal centers), control physiological function (such as vascular innervation, hormone secretion, etc.) "only in relation with the manifestations of

volition, feeling, and emotion" (1974, p. 106). Avalon points out that this tantric view is in contrast to the scientific view of the spinal centers (including the sympathetic system) as mechanisms of only unconscious adaptation to environmental conditions. Anandamurti also holds this assertion that the *sahasrara's* control over the *vrtti*s, whether in the *sahasrara* or *chakra*s in the body, links the body's physiological functions to emotional and cognitive processes. What distinguishes Anandamurti's position, though, is that he attributes specific emotional and other types of states to each of these letters on the *chakric* petals. We will examine the operations of the *vrtti*s as "seeds" of emotional states in more detail in the next section on the mechanisms of emotion.

Moving to another point on the tantric views of different types of emotion, according to a standard view of yoga, there are two general tendencies that generate emotional processes: attachment and aversion (Whicher, 2007; Miller, 1995). In Yoga, as we saw in chapter four, *klista vrttis* or painful mental processes are created by the activity of the *klesha*s. Attachment and aversion are two of the five *klesha*s that are particularly relevant when discussing quieting of *emotional* "afflictions" (*klesha*s). These two are central to the Yoga Sutra view of psychological process whose quieting during yogic practice brings emotional flux under self-control, especially transforming negative emotion. Thus when the mind's tendency to move in patterns of attachment and aversion to the worldly character of existence is quieted, one can enter higher stages of meditation.

Neuroscience: Valenced Action Tendencies and Emotion Programs

To understand a neuroscience perspective on the emotional state associated with meditation, it is helpful to have a context of psychological research on emotion. The

neuroscience of emotion focused for a long time on negative emotion (Fredrickson, 2004). For example, LeDoux (e.g., 1985) characterizes the neurocircuitry of fear and anxiety. Two related notable exceptions to this trend are reward and pleasure (Papez, 1937; Maclean, 1949, 1952). The field of emotion research seems to have followed this path of examining negative emotion for some time, likely because of the advantages of using animal models to study fear through both behavioral and, more recently, neuroscience techniques. However, Fredrickson (2000) explains that more recently there has been increased attention given to studying positive emotion. Early accounts of positive emotion, such as concepts of well-being, suggested that well-being could be viewed in terms of an absence of negative emotion, with later accounts suggesting that additional features were needed to be classified as a state of well-being such as the presence of positive emotion. Contemporary neuroscience research on meditation is one line of research in this direction of understanding positive emotions.

Frijda (1986) argues that there is a qualitative aspect of emotions accompanied by physiological changes, a view of emotion he terms "action tendency." Meanwhile, Gross (1998) points out that Darwin and more recent emotion theorists such as Izard (1971, 2007) and Ekman (1992, 1999) argue for a small set of discrete *basic* emotions, or "emotion programs" of specific emotions such as fear, anger, and happiness. These views are not necessarily incompatible, however, since emotions as action tendencies differ in terms of mode of activation and autonomic response (Frijda). Thus, emotion programs stored and then enacted in the brain could elicit action tendencies motivated via bodily responses. Compassion (Lutz, Brefczynski-Lewis, Johnstone, Davidson, 2008) and joy

(Fredrickson, Coffey, Pek, Cohn, and Finkel, 2008) have been recently studied in association with meditative practice.

Starting from the early 1970s, Western research on meditation that dealt with emotional issues was focused on the relaxation effect, which is associated with with positive feelings of calmness and peacefulness as experienced in a wide range of meditation techniques (Murphy and Donovan, 1997). More recently, meditation researchers (e.g., Lutz, Dunne, and Davidson, 2007) have called for understanding meditation techniques with greater specificity, with the hope of understanding how goals and variances in techniques can result in different effects, such as changes in emotional states. Along this line is research that investigates meditation methods that are aimed at cultivating specifically positive emotional states such as happiness. For example, a meditation technique that has been the focus of many recent studies in neuroscience and clinical research on meditation is meta-meditation (or loving-kindness meditation) that is aimed at cultivating a state of compassion (e.g., Pace et al., 2009; Lutz, Greischar, Perlman, and Davidson, 2009). This technique has been associated with increases in empathy. A possibly surprising finding of one study of meta-meditation was an increase in joy associated with the state of compassion (Fredrickson, Cohn, Coffey, Pek, and Finke, 2008). These findings are relevant to this study on *ishvara pranidhana* because there are important similarities between meta-meditation, a Tibetan practice that has close ties with tantra, and tantric yoga meditation. Most significantly, meta-meditation involves the use of repetitive phrases, which is similar to mantra. Thus, while relaxation may result as a side benefit of *ishvara pranidhana*, the specific state of absorption may be more important.

Comparison: Emotion Programs and Meditation

Yogic and neuroscience systems identify similar conceptual systems for specific emotion programs of normal states. There are many of these programs in common for both systems, such as happiness, anxiety, fear, anger, and joy. Also, both systems' descriptions of these emotions invoke similar qualitative states of emotion. However, the qualities of the emotions described by the different systems seem to differ in an important way. The neuroscience descriptions of emotions of meditation describe concrete emotions such as joy, empathy, and compassion, that all have positive connotations to them, thus they could be described as more "emotional," while emotion in tantric yoga states of meditation have a more spiritual connotation – absorption - which focuses on peacefulness and calmness. These yoga qualities seem to have a more neutral, although still positive in some sense, connotation; however, absorption also is associated with joy and even ecstasy, and these are positive. Thus, an important difference is that tantric yoga reveals a mystical quality to the meditation state of absorption, which is often not identified in scientific studies of meditation.

Another difference between the two systems is the location of the source of the emotions. The *cittavrttis* of the tantric yoga system are located around the *chakras* within the spine and torso of the body, as well as in the head and neck, while the neuroscientific structures of emotion are in the brain, thought to be in the limbic and cortical cognitive systems of the brain (Le Doux, 1995). More will be said about this point in the next section on mechanisms of emotion, as well as the similarity in explanations from both systems regarding the shift in "I" feeling.

2. Mechanisms of Emotional Experience and Perception

The current view in neuroscience is that the experience of emotion is in the brain (or at least in the CNS), but that this experience happens as a result of central nervous system (CNS)-body (e.g., neuroendocrine, peripheral nervous system) and environment interactions, although the directionality of these interactions is not well-understood (Lazarus, 1993); LeDoux, 1995; Davidson, Jackson, and Kalin, 2000). The finding that brain area X changes activity more than area Y is an important step towards articulating mechanisms (Davisdon and Irwin, 1999). This view is supported by a huge line of research on hormone-CNS interactions, counting adrenaline/noradrenaline and stress hormones, etc (Fredrickson and Joiner, 2002). Hormones are now thought to have great influences on mental process and emotion; the brain is filled with receptors for these hormones and manages the secretion of hormones (Davidson and Irwin, 1999; (Fredrickson, Mancuso, Branigan, and Tugade, 2000). Moreover, emotional experience is shaped by past experience (e.g., learning and the effects of stress hormones on the structure and function of the hippocampus) (Fredrickson, Mancuso, Branigan, and Tugade, 2000). Emotion can also be modulated or primed by the periphery of the body (that is, non-central nervous system tissue). In sum, while the experience and perception of emotion is still considered to be in the brain, their instigation and modulation is now conceptualized as a brain-body and environment interaction.

Tantric Yoga: Mechanisms of Absorption

One of the central ideas of tantric theory is that cosmic structures operate within the body of each individual (White, 1996; Padoux, 2002; Flood, 2006). When analyzing

tantric processes of absorption, I found that a central feature of this process was that cosmic structures take on an emotional nature when operating in the human dimension. Tantric yoga theorizes two mechanisms involved in normal emotional flux and meditative absorption that are both linked to cosmic configurations and located in the body. The first involves the structure of the tantric subtle body and the second is the mantra itself; though, according to tantric theory, mantra itself is postulated to be embedded within the structure of the person (Muller-Ortega, 1992).

White (2000) explains that the cosmic structures of the tantric mandala of energy levels manifest themselves in a number of ways (see also Avalon, 1919/1974). For example, in one form, the energy levels manifest as the hierarchized *chakras* located within the yogic body. In another form, these energy levels also represent themselves on a graphic level as written characters of the hieratic alphabets, and thus manifest on acoustic levels as phonemes in the form of mantras. These acoustic levels are also implicated within the structure of the yogic body. This dual manifestation is important for tantric meditation because mantras are recited for the purpose of influencing the perturbances of the *chakra* centers in specific ways. In this way, the cosmic energy structures are theorized from this emic perspective to operate within the person in two primary ways: through the fluctuation of the *chakra*s and through mantra. Both of these processes stem from the theorized emanation of the material world from the divine core of reality, and this theorized core source is important to understanding absorption and other emotion processes of meditation (Muller-Ortega, 1992).

White (1996) explains that there is a phonematic nature to the emanation substances, including those of the human body. This insight is crucial to understanding

the role of mantra in transforming the psycho-emotional states during meditation as one enters absorbed consciousness. Wheelock (1989) makes clear that in the tantric view, mantras (as phonematic expressions) are themselves fundamental constituents of the universe. The subtle nature of the consciousness of the universe interpenetrates with the mind-body structure through the complex network of *chakras* and *nadis*. Muller-Ortega (1992) explains that the cosmic urge to manifest eventually results in the generation of phonemes and these coalesce in interference patterns or cognitions. Earlier in the mechanism section of the memory chapter I explained that for tantra, perception results when the individual consciousness coalesces around the phonemes that are organized into interference patterns (or cognitions) that form subjective/objective orders of human perception. Now we can add to this understanding of tantric thought by recognizing that cosmic phonemes become patterned within the yogic body around the *chakric* centers, and these phonemes are therefore what constitute the petals of each *chakra* (White, 1996). What White calls petals (of the *chakras*) Anandamurti refers to as *vrttis* (perturbances). This phonemic nature of the *chakra* structure constitutes the individual nature of *citta* (mind) within the person. In other words, these patterns take on an emotional nature when located within the body in the specific areas of the "petals" of the *chakras*. The flux of these phonemes in motion is the expression of the ordinary personality complex.

The two subtlest phonemes or *vrttis*, which are petals of the *chakras*, are located in the *ajna chakra* - the *chakra* located near the eyebrow center (Avalon, 1919/1974; White, 1996) - which Anandamurti (Sarkar 1959; 1991) associates with the pituitary gland. Anandamurti declares that these petals reveal the twofold function of the *ajna*

chakra, worldly knowledge and spiritual knowledge, making the *ajna chakra* (from the yogic perspective) the seat of the mind. Anandamurti links these functions with the spiritual (the left side petal) and material (the right side petal) visions of the world. Through these two petals, the mind controls the *kleshas* (or mental afflictions) of aversion and attachment. The *klesha*s are linked into the fluctuation of these *cittavrttis* of the *chakras*, and thus this fluctuation that is tied into the cosmological emanation process is the mechanism of how we continually generate and quiet the same painful wave patterns (Chapple, 1982). Yet even subtler non-manifest vibrations or substrates of sound exist beyond the mind located within the *ajna chakra* and its two petals (White, 2006). This concept of functional laterality (or functional asymmetry) also plays a major role in the mechanisms of emotional programs described by neuroscience.

Anandamurti's (Sarkar 1959, 1991) "seed" view of mental propensities reveals important particulars of how Anandamurti localizes Samkhya-Yoga philosophy in the body. For Anandamurti, the seed of every petal or *vrtti* of each *chakra* is located in the brain, with the first expression of the *vrtti* occurring in the "sub-station" or gland – that is, it is expressed through the lower *chakra* with which it is associated. Thus "waves" of the mental perturbance or activity are theorized in terms of the activation of the seed in the *sahasrara*, stimulating the glands and expressing the *cittavrtti* through the nerves, because the *vrttis* as the petals of the *chakras* are associated with the glands of the endocrine system.

Eliade (1958) describes correspondences between the first five *chakras* and *tattvic* elements (earth, water, fire, air, and ether), thus associating the *tattvas* with the body as well. Eliade explains that the Yogatattva Upanishad indicates that each element also

corresponds to a particular mantra, a "seed-vibration" or mystical syllable that can be recited during tantric ritual practice. This *chakric* system forms the model for Anandamurti's method of *ishvara pranidhana* meditation. White (1996) explains that, when the yogin raises the *kundalini*, the *tattvas* and material substrates of the body dissolve because the meditator "telescopes" phonemes, absorbing each into more subtle ones. This is an important meditation process with emotional significance, because the emotionally charged petals all become pierced by the *kundalini sakti* (spiritual energy) during deep states of meditation and this transforms their perturbance pattern.

A primary claim about mantra from the tantric yoga perspective is the view of mantric utterance during meditation as a method for attaining a "real" religious or spiritual transformation: the purpose of mantra recitation (*japa*) is to "recollect" the pure awareness (Timalsina, 2005). Alper (1989) suggests that mantra can be seen as a tool that can lead one to cognize the world in such a way that he "realizes" the world really is all right. Such cognition depends on a particular type of memory discussed earlier: memory as remembrance. This memory is an emotional memory. This is because during tantric meditation, the deity that is the object of visualization and subject of mantra recitation is thought to develop into a complex embodiment of the entire created universe within the person rather than remaining an abstraction (Wheelock, 1989). Thus the deity operates within the individual personality as a cosmic structure. In this way, the cosmic structure takes on psycho-emotional nature. Both human nature and the devotional character of the meditative process of *ishvara pranidhana* make it emotional.

It is possible to see the yogic perception or realization as a "remembrance," rather than as solely an in-the-moment perception or insight by thinking about memory (*smrti*)

in the sense of mindfulness (Miller, 1995). This perspective helps us bridge between certain cognitive and emotional processes that are supposedly quieted during meditation such as memory in the form of *smrti* (recalled phenomenal experience). In this sense, we can see the "remembrance" as awareness. What is remembered or brought to awareness is postulated in this theory as an eternal truth: "remembering" one source of truth in the present moment. During this state of awareness, the object becomes the subject and the subject becomes the object.

We have just examined the basis of how the meditation technique of *ishvara pranidhana* uses mantra to telescope the phonemes of the *chakra*s and absorb lower ones into more subtle ones. Because in this theory the mantra that is recited during *ishvara pranidhana* exists in some way within the *chakra* structure itself, in the same way that the other phonemes are, the mantra that is recited itself becomes a mechanism of emotional transformation. When it is recited, it vibrates; in this way mantra influences the surrounding phonemes in a particular way. This theory further posits that each phoneme is pulled or drawn back to the "source" the phoneme resonating at the highest frequency.

While the ordinary personality manifests as the flux of consciousness vibrating throughout the *chakra* system, this ordinary fluctuation becomes absorbed during concentrated states of absorption. In other words, in ordinary states, individual consciousness expressed through unique patterns of phonemic activity fluctuates within the subtle structure of the body according to an individual's personality complex interacting with social-environmental and moral contexts. But while vibrating within particular environmental contexts, the matrix of the phonemes (i.e., sounds, vibratory resonances, powers, etc.) also vibrates within the cosmos.

The important point for meditation is that, through the meditation process, the matrix of the phonemes of the *chakra*s within the yogin's body comes to resonate with the matrix of the whole of the cosmos. Muller-Ortega (1992) asserts that this singular vibration equals a "self-referential doubling back," and is a unique motion "asynchronously present" within the cosmos. This motion is the vibration or *spanda* (oscillation) of tantra. The meditative feeling comes when an individual's vibration (or consciousness) becomes harmonized with the oscillation of Siva (Muller-Ortega, 1992). In absorptive meditation, an individual's "I" feeling transforms and becomes identified with Siva. Awareness of absorption of one's own psychomental flux into this cosmic motion is what feels blissful to the practitioner. Thus, states of awareness and emotion are linked with the nature of the *chakra* system as a pulsating vibrational flux within the universe.

Neuroscience: Mechanisms of Emotion

One major challenge of neuroscience has been to establish whether there are specific neuro-activation patterns for discrete types of emotion. Murphy, Nimmo-Smith, and Lawrence (2003) used a meta-analysis to find clear support for separate neural spatial distributions (or regional specialization) associated with three different affect programs (fear, disgust, and anger), while they found no significant difference between the spatial distributions associated with other affect programs (happiness and sadness). For example, they found evidence for regional specialization of fear in the amygdala, and of anger in the lateral orbitofrontal cortex. They also found a more general role for the anterior cingulate and medial prefrontal cortices; for example, both of these frontal areas were

found to be activated during happiness and sadness as well as other discrete emotions. Similarly, the insula and anterior cingulate regions have been shown to be activated in the positive emotion of empathetic response to another's pain (Singer et al., 2004; de Vignemont and Singer, 2006; see also Lutz et al., 2008).

Further lines of research have investigated that the well known phenomenon that emotion is at least partially separable into dual categories of valence (positive vs. negative emotions), emotional arousal (calm vs. excited), and affective style (approach vs. withdrawal) (Murphy, Nimmo-Smith, and Lawrence, 2003). Together, variances among these categories, which reflect phenomenological experience, yield subtle shifts in emotional tone. For example, variability in brain activation is associated with specific types of emotion. A number of theorists argue that emotions are organized around the two basic response patterns of approach and withdrawal (or avoidance) action tendencies (e.g., Davidson and colleagues, 1992, 1998, 2004; Lang, Bradley, and Cuthbert, 1997; Schmidt and Schulkin, 2000), basic response patterns fundamental to adaptive behavior (Carver, Sutton, and Scheier (2002). Approach systems facilitate goal-directed behaviors in which subjects move toward pleasant stimuli and abstract goals, and approach systems can generate certain positive emotions (Davidson and Irwin, 1999). In contrast, withdrawal systems facilitate moving away from aversive stimuli or perceived harmful circumstances and generate a selection of negative emotions, whereby one may identify such a situation and enact a proper course to respond (Davidson and Irwin, 1999).

Davidson (1998) proposed well-defined neuroanatomical underpinnings for approach and avoidance (or withdrawal) systems, with strongly similar left/right activation patterns as positive/negative (respectively) valence. Specifically, high levels of

left prefrontal activation and effective modulation in the amygdala is associated with the approach system, while right-sided prefrontal activation and slow recovery in response to negative and stressful events is associated with withdrawal systems. (For a more detailed review regarding behavioral activation and inhibition systems, see Cloninger, 1987, and concerning appetitive and aversive systems, see Lang, Bradley, and Cuthbert, 1990).

One of the main patterns found to distinguish between positive and negative emotions is asymmetrical activation of the brain's hemispheres, (especially the PFC or frontal lobe) (Hellige, 1993). Hemispheric asymmetry is evident in electrophysiological studies of cortical activation in normal subjects exposed to stimuli that elicit emotion. A number of brain studies on emotion processes show a general tendency for right side neural activation associated with negative emotion, while left side activation correlates with positive emotion, especially associated with right and left anterior (frontal) PFC activation (see Davidson, 1992, 1998, 2000). For example, Waldstein et al. (2000) found that happiness-inducing tasks evoked more prominent left than right frontal EEG activation, and greater left frontal EEG activation than anger-inducing tasks. An alternative hypothesis is that the right hemisphere is dominant in all forms of emotional expression and perception, such that overactivation is associated with negative emotion and underactivation is associated with positive emotion (Hellige, 1993).

Note, however, that the approach-withdrawal model varies somewhat from the valenced asymmetry model, since not all negative emotions tend toward withdrawal actions; anger, for example, tends to motivate approach behaviors. This is consistent with findings that anger-inducing tasks were, on average, associated with comparable left and

right frontal EEG activation (Waldstein, et al., 2000). Shifting emotion programs in the brain by way of attentional tasks like meditation could impact emotional behavioral style.

Davidson and colleagues investigated individual differences in lateralized activity. For example, individual differences in the degree of lateralization have been found in infants and adults in behavioral studies (Davidson and Fox, 1989). Moreover, right sided activation has been found to be associated with a number of factors including mood and anxiety disorders (Henriques and Davidson, 1990, 1991). Davidson (2000) suggests that activation asymmetry can be viewed as a trait-like construct, since some measures have been found to be stable over time and meet a number of psychometric criteria (Tomarken, Davidson, Wheeler, and Kinney, 1992). A number of studies of meditation have suggested that individual differences are important in studies of meditation, too, and individual differences in the emotion processes may play a role in the differences seen between individuals reported in meditation experiences. For example, it could be that while everyone might be able to experience Oneness in theory, not everyone will experience it in the same way.

As discussed previously, one of the most consistent findings from outcome studies of meditation is that meditation helps decrease stress (Delmonte, 1995; Murphy and Donovan, 1997). Insight into these stress modulatory mechanisms could come from studies of startle responses. For example, Davidson, Jackson, and Kalin (2000) argue that findings showing that greater left-sided prefrontal activation is associated with faster recovery time imply that individual differences in prefrontal activation asymmetry play a role in emotional responding and recovery from stress. As Davidson et al. (2000) note, LeDoux's (Morgan, Romanski, and LeDoux, 1993) lesion studies of rats might provide

some evidence suggestive of possible mechanisms of this asymmetrical activation because this study suggests evidence for a descending pathway from the medial PFC to the amygdala, a pathway that is inhibitory and could mediate extinction. Davidson (1998) suggests that it is specifically the left PFC that exerts inhibitory influence on the amygdala in humans and other primates. The amygdala is thought to be centrally involved in threat perception and in generating negative emotions of fear and anxiety (e.g., LeDoux, 1995). Support for this idea is the coupling of decreased glucose decreased metabolic rate in the amygdala with increased metabolic rate in the left PFC (Abercrombie et al., 1996).

Davidson et al. (2003) showed extremely high levels of activity in the left prefrontal cortex of a meditating monk, an area of the brain closely correlated with happiness and positive affect. Davidson points to a number of questions surrounding this finding that need to be answered to determine how to interpret its wider significance. For example, if his PFC levels were high before he started practicing meditation, perhaps this is what drove the monk to pursue a life on monastic contemplation. Combining findings on the amygdala and PFC with evidence that meditation affects changes in the PFC (see also e.g., Lazar et al., 2000), Davidson suggests that neural pathways between the PFC and the amygdala could mediate the stress-reduction effects of meditation. Although there is evidence that the switch from negative states to positive meditation states involves moving between unique configurations of circuitry for specific emotion programs, there are still theoretical questions about what drives these shifts.

Lutz, Brefczynski-Lewis, Johnstone, and Davidson (2008) extended findings on positive emotion in meditation by showing that activity in regions implicated in

empathetic responses (e.g., the insula) can be modulated through voluntary regulation of emotional responses by intentionally generating compassion during meditation. In their study, Lutz et al. used fMRI to probe affective reactivity during a compassion meditation state and found that expertise in cultivating positive emotion through meditative practice alters the acting of circuitries previously linked to empathy. In an earlier study, Lutz and colleagues (Lutz, Greischar, Rawlings, Richard, and Davidson, 2004) found self-induced sustained electroencephalographic high-amplitude gamma-band oscillations and phase-synchrony during meditation. This synchronization and de-synchronization of firing between patterns of neural populations has been suggested to indicate large-scale integration of functionally specialized regions of the brain involved in different aspects of conscious experience (Lutz, Dunne, and Davidson, 2004). Taken together, these studies might indicate that coordinated oscillations in the brain potentially contribute to emotionally valenced phenomena such as states of consciousness entered into during meditation.

While the exact functional role of specific neural structures remains to be clarified, the conclusion so far is that there is some regional specificity, and hemispheric specialization, for at least some types of emotions. Other brain regions appear to be more globally involved in emotion generation, and emotions may be involved in the coordination between distinct brain areas. This hemispheric asymmetry in the brain of emotional processing plays a key role in emotional processes, and in the emotional dimensions of meditative phenomena.

Comparison: Asymmetric Activation and Emotion Programs of Meditation

Both perspectives have views of partial separability of positive or negative emotion and approach and withdrawal and motivational forces, and both instantiate this separability in terms of affect programs located in the body. A comparison between the tantric yoga and neuroscientific perspectives on the emotion mechanisms of meditation indicates that both systems agree that meditation alters emotion processes and that asymmetry is the general mechanism of emotion. Yet these two perspectives differ as to how the mechanism of asymmetry operates. This is largely because of radically different views of the energetic systems and structures of the body. On the one hand, tantric yoga theorizes a non-physical reality that generates the experiential phenomena of absorption, while on the other hand neuroscientific accounts posit physical structures localized in the brain. Any non-physical propositions from the neuroscientific perspective describe theoretical processes with functional significance, although these are also usually theorized in terms of their association with physical processes of the brain.

Although hemispheric asymmetry is evident in both systems, this concept is directly utilized in the neuroscience literature to explain an element of emotion processing. Though it can also be seen in the tantric yoga explanations of emotion, the term is not used. Both systems cite activity in right vs. left-sidedness within the head as an important mechanism to generate contrasting sorts of emotionally-valenced experiences. In neuroscience, right and left-sidedness has to do with the two hemispheres of the brain, while in tantric yoga sidedness is related to the right and left petals of the *ajna chakra*. In both systems, the same side (left) is associated with good experiences while the other side (right) is associated with undesirable experiences, though the

concepts and values of "good" and "bad" differ between the systems. Specifically, in neurophysiology the right side neural activation is associated with negative emotion and that left-side activation correlates with positive emotions, especially in the anterior frontal PFC. Meanwhile, Anandamurti asserts that the left-side petal of the *ajna chakra* is related to spiritual discrimination while activation of the right petal generates worldly experience. Thus positive emotion and spiritual experience are linked to the left hemisphere of the head while negative emotion and worldly experience are linked to the right side of the head.

Affective style in neuroscientific literature, conceptualized in terms of approach and avoidance, also seems to closely parallel the two related yogic *klesha*s of attachment and avoidance. Moreover, both tantric yoga and neuroscience have a notion of specific emotions or "affect programs" associated with separate spatial distributions located in the body within the nervous system. The specifics on this point differ significantly between the two systems, though, since Anandamurti claims that specific affect programs are associated with particular *chakras* located within the body, while the affect programs of neuroscience originate in the brain.

However, localization of emotion programs within the body is not the complete picture for tantric yoga, because this system also has a "seed" notion of the mind whereby a collection of the seeds of all possible mental expressions are located within the head, and in particular within the *sahasrara chakra* within the head. Thus, the "seed" view of the *chakra* system matches more closely with the affective neuroscience view in that, in both, views emotions are first generated via activity in the brain region.

Taking note of another difference between yogic and neuroscientific views, yoga literature also associates the various *chakras* with specific bodily organs whose functions seem to loosely relate to the designated function of the *chakras* (see chapter four). Anandamurti extends this claim of association with bodily regions and organs to specific endocrine glands.

Although both yogic and neuroscience perspectives locate emotion generation in the body, and within the nervous system, they each offer very different views of the body to explain emotion. It is useful to again mention here the historical point that traditional tantric yoga models of the body made no mention of the brain. But modern yoga does incorporate the brain into its view of the body, as its relation to emotion function. In other words, modern tantric yogis such as Anandamurti, the Sivananda yoga school, and Bihar School of Yoga, accept neuroscience ideas of the brain, but still retain traditional medieval tantric alchemical and yogic views about the body being associated with the subtler level. Nevertheless, even though the tantric yoga model of *ishvara pranidhana* is closer to the modern neuroscientific view of the body than a medieval model would be, it is still sufficiently different.

Perhaps one avenue towards determining whether there is some sort of consilience between these two views is to consider the possibility that the tantric view taps the human body into the deepest underlying structure of the universe, while the neuroscience perspective examines the close-up view of neural systems and cellular mechanisms with analysis deepest at the ionic level, but without consideration of potential continuous interconnections with systems outside of recognized bodily systems. One point of similarity on this issue of self-environment interconnection is that both

systems identify oscillation as a primary process associated with mental states of meditation. As we have seen, synchronization of oscillations across different brain regions (each with its own unique function) has been proposed as an underlying integrative process to explain conscious states. Synchronization of fluctuation of an individual's phonemic structure of the *chakras* system with the oscillation of the cosmic structure has been asserted as the aim or resultant state during meditative absorption. Oscillation is evoked in a similar manner in both systems, though the significance of oscillation as a process differs, as do the mechanisms associated with this process.

Moreover, yogic and neuroscience systems have differing concepts of energy and sources of power. The idea of emotion as "action tendency" gives the sense that emotion somehow powers the body into action. But the two systems have different notions of power. For tantric yoga, power (*sakti*) is ultimately sourced by Siva, which is contained within the body in the form of *kundalini sakti*. Thus, power has connection to the spiritual principle that is thought to lie in a dormant form coiled at the base of the spine, i.e., *kundalini sakti*. This is the spiritual power/force of the person. In the neuroscience view, the brain is powered through electrical impulses that move within and between each neuron, impulses that are generated through on-going electrochemical activity throughout the brain, and also powered through the influx of electrochemicals from blood that flows with greater volume in regions of increased electrical activity. Here we can note the difference that in tantric yoga the body is phonemic in nature while in neuroscience phonemes of sound are energy rather than matter. However, examining potential ways in which electro-chemical energy compares with the "spiritual" energy of tantric and hatha yoga's *kundalini sakti* goes beyond the scope of the project at hand in this dissertation,

though I think that such a comparison would be useful towards comprehending important core differences in the worldviews of these two systems.

3. Implications: The Role of Appraisal Processes in Emotion Generation

The preceding comparison between the tantric yoga and neurophysiological types and mechanisms of emotion has implications for Alter's (2004) problem of understanding the "truth" of yogic experience, and how this problem is related to Proudfoot's (1985) problem of trying to explain mystical experiences such as meditative absorption. Therefore, here we consider whether, in light of the above comparative analysis of emotion processes of meditation, the "truth" of yogic experience cannot be explained by either philosophy or science as Alter claims. Alter's position is similar to Proudfoot's, with the distinction that Proudfoot thinks mystical phenomena, such as yogic absorption (in the specific case examined in this dissertation), can be explained by naturalistic accounts.

Proudfoot (1985) argues that the particular beliefs of the subject, beliefs that are necessarily cognitive in nature, generate an appraisal and that this appraisal becomes the label of "mystical" or "transcendent" regarding an experience such as absorption during *ishvara pranidhana* meditation. The cognitive appraisal is the judgment someone makes that that experience is a "mystical experience." Proudfoot asserts that this appraisal is a cognition or belief that *constitutes* the experience. This view contrasts with James' (1902) view of the ineffable quality (the feeling) of the mystical experience as being primary. Also in contrast to Proudfoot's position, Barnard argues that the mystical experience is precognitive, that it is an immediate, intuitive, and direct emotion. In Barnard's view, the

labels “mystical,” “absorptive,” or “transcendent” do not reflect cognitive operations or a raw emotional experience; rather, these labels indicate a phenomenological state. Barnard criticizes Proudfoot’s model of emotions, arguing that it is based on faulty psychological analysis and on faulty philosophical grounds. What is at issue is whether there is a special quality of “mystical” feeling of absorption. This debate is important in the context of my argument for an interdisciplinary approach to understanding meditation because it addresses whether religious theories are secondary or primary to explaining experience.

Proudfoot (1974, 1985) thinks cognitive appraisals are primary because he assumes that cognition is identical with belief, and, in his view, the belief fundamentally constitutes the religious experience. In this view, the appraisal that is the religious belief generates the religious nature of the experience. In this way, meditators interpret physiological signals (that can occur in the form of arousal) as signs of religious experience. Proudfoot further argues that scholars who argue for the primacy of emotion over the primacy of religious theory to explain religious experience do so by way of conflating emotion with religious experience. He names James and Eliade, among others, as scholars who fall victim to the mistake of contending that the emotion itself, such as the feeling of absorption during meditation, is constitutive of the experience labeled “mystical.” Proudfoot’s argument to interpret religious experience via the lens of the religious theory – the belief – reflects a naturalistic approach; i.e., understanding religious experience through a “social-scientific” or “psychology of religion” approach of asserting belief systems as causal rather than accepting some “supernatural” explanation. In addition, naturalism assumes a subject-object ontology that is in conflict with the “reality” expounded in some emic traditions such as yoga. By conflating emotion with

religious experience, Proudfoot argues, James, Eliade, and others fail to recognize the evocative power of language in shaping, constituting, or generating religious emotion, and instead see emotion solely in religious terms. Their criteria for religious experience – that the experience is ineffable, for example - necessitates that the experience cannot be explained by naturalistic accounts. This strategy of viewing emotion as primary for generating religious experience protects their approach from other, e.g., naturalistic, accounts.

Proudfoot (1985) argues against using this sort of "protective strategy" to study religious experiences such as the sort of mysticism associated with yoga meditation. He distinguishes between *descriptive* reduction and *explanatory* reduction, arguing that it is correct and necessary to formulate *descriptions* of mystical experience from within the perspective of the mystic. However, when attempting to *explain* the mystic's experience – the feeling of transcendence, for example - it is correct to step outside the practitioner's worldview (emic explanatory model) and evoke naturalistic etic accounts. He argues that explaining mystical feeling requires some account of the cognitive appraisal that generates the experience. He reasons that James, Eliade, and others conflate emotional and religious experience, and thereby fail to adequately explain the phenomena they seek to reveal. Instead, Proudfoot argues, they evoke descriptive language that contains an explanatory criterion within the description of the experience – the criterion of "ineffability" - thus protecting the description as if it explains the phenomenon. In actuality, according to Proudfoot, this sort of causal description does not explain; rather, the belief is constitutive of the experience and, therefore, must itself be elucidated to fully explain the phenomenon.

This debate bears on the fundamental issue of scientific research on mystical experience. Alter (2004) argues that science, what Proudfoot terms a "naturalistic" framework, cannot explain the "truth" of yogic experience. In other words, scientific theorizing about experimental data related to meditative phenomena can never fully explain what the meditators themselves experience during states of absorption. Because an examination of the philosophical issues relevant to the question of explaining meditation are beyond the scope of this dissertation, I will focus here on the psychological analyses that draw out what sort of criteria are used to label mystical experience.

One of the main psychological studies Proudfoot cites is the now-famous Schachter and Singer (1962) adrenaline experiment in which the researchers injected adrenaline into subjects to increase arousal. Schachter then manipulated environmental contexts, in which appraisals (or cognitive interpretations of events) were drawn from situational contexts to explain adrenaline-induced emotional states. The findings of their study, although highly controversial, provided support for James' original theory that emotions result from physiological arousal. However, the study also lends support to the notion of emotion as a non-specific state of arousal *whose meaning we derive from context*. Thus, the evaluative component of intuitive direct appraisal ties the object to oneself in some meaningful way. Schachter argued that there is a preponderance of evidence showing no physiological difference among various emotion states, that high levels of emotion results in a high level of sympathetic activation with few if any physiological distinctions among the many possible emotional states. Therefore, he argues, cognition determines the emotional labels applied to a common state of arousal;

emotion accompanied by undifferentiated physical arousal is attributed to whatever is the most salient contextual cue. Schachter specifies that arousal plus cognition equals two necessary ingredients that combine to form specific emotions. In this view, specificity of emotional nuance is derived from cognitions and not from the physiological change. Subsequent emotion theorists have used Schachter and Singer as evidence for the non-specificity of autonomic activity during emotion, and as evidence for ambiguity in the interpretation of emotional experience, thus necessitating situational contexts to provide appraisals or interpretations of autonomic and emotional reactivity.

Issues at the heart of Schachter's study reflect a main source of debate between Proudfoot and Barnard on the issue of explaining mystical experience. The findings and theorizing from Schachter's experiment were used as an opening for Proudfoot to argue that claims appraising "mystical" experience or transcendence are drawn from the religious or emic context rather than from an internal perception of some altered state, and therefore those claims carry no weight as proper appraisals or labels of such phenomena. This argument undermines the yogic belief system and potentially all belief systems suggesting the reality of mystical phenomena. While I agree with Schachter that appraisal processes certainly play a role in determining the emotion labels, there is a need for a better model of Schachter's "cognitive factor" and for describing ways in which cognition and physiological states interact. I have tried to do this by distinguishing between a personal biological level and a cosmic level, and by recognizing that the two must operate simultaneously within each individual.

More recent studies suggest a better model of Schachter's "cognitive factor," and it is the one described above as the neuroscience mechanisms of emotion. Now we need

to apply this updated naturalistic model to understanding meditation. An older psychological view of appraisal from Schachter's time is still useful for this because rather than focusing on physiological arousal, Arnold's (1960) appraisal model offers psychological theories of appraisal processes based on her intuitions about brain processes that are still applicable today in light of recent understandings from neuroscience (Kappas, 2006; Reisenzein, 2006). I will re-examine Proudfoot's argument for cognitive primacy generating mystical experience, and the related experimental findings, in terms of Arnold's brain-based psychological view of appraisal. According to Kappas, Arnold (1960) asserts that there are two types of appraisals: one type is direct, immediate, and intuitive, while the other is reflective and conscious. The first type of appraisal is like what many emotion theorists seem to have in mind when they argue for the primacy of emotion (e.g., Zajonc, 1980), while Arnold's second type of appraisal indicates the sort of appraisal that cognitive appraisal theorists (e.g., Lazarus, 1984) argue for as primary. The "intuitive" appraisal is immediate and the reflective judgment follows (Kappas, 2006). Schachter's appraisal theory leaves out the evaluative function (or process) of emotion specifically about the actual causation of emotion, while focusing on the role of cognition "in the process of emotion generation in terms of the attributions regarding the cause of the perceived arousal" (Kappas, p. 959). I think that it is the evaluative rather than the intuitive type of appraisal that Proudfoot argues for as primary to explain religious experience.

Arnold's central point is also that emotion is generated by appraisal processes. However, her intuitive appraisal is not reflective like, for example, decoupling from the rigid stimulus-response connection as a main and adaptative function of emotion

(Kappas, 2006). On the issue of evaluation, Arnold assumes that the person first acquires the factual belief, for example, through perception or inference (Reisenzein, 2006). This acquisition occasions the evaluation of emotion as positive or negative. The evaluation is typically direct, immediate, and intuitive; it seems at least in part that the evaluation is intuitive because it frequently consists only of the retrieval of previously made evaluations from memory (Reisenzein, 2006). Together the factual and evaluative belief then causes an emotion directed at the same object. As we have seen, memory processes are involved in present moment appraisals of events. The main issue for meditation from this perspective is the acquisition of a factual belief (through perception or inference) and the subsequent evaluation of the state of affairs as a positive or negative retrieved memory.

Arnold explains that while there are two types of appraisal there are three appraisal processes, and these all center on her assertion that emotions have an object with these properties: 1) evaluation of the object as good or bad for oneself (i.e., appraisal in the narrow sense of the word); 2) presence-absence of the object; 3) the coping potential, i.e., the ease or difficulty to attain or avoid the object. However, Arnold herself points out that only the first is evaluative in nature (an evaluative belief), while the remaining two are factual beliefs. Proudfoot also discusses the object of emotional experience. He says that when describing the religious experience, one must identify the religious or mystical feeling by reference to a specific object (and by this cognition or belief religious theories come to be primary).

As we have seen throughout this dissertation, practitioners of *ishvara pranidhana* meditation take *ishvara* (or god) as the object of meditation. Because we are trying to

understand absorption and especially the application of such labels as "transcendent" to meditative phenomena, let us briefly analyze the meditation processes of *ishvara pranidhana* in terms of Arnold's three appraisal processes with a focus on *ishvara* as the object and practitioner's evaluation of absorption in terms of transcendence or *samadhi*. Looking at this will help us see what type of appraisal best encapsulates the subjective or theorized evaluation of absorption as being transcendent or mystical.

Cognitive evaluation has been shown to be evoked by a variety of emotional stimuli such as emotionally evocative pictures (images) and words with affective meaning. Evidence from several lines of research supports the idea that emotional concepts are structured and stored in semantic memory (see Holt, Lynn, and Kuperberg, 2008 for discussion of this literature). Emotion has been shown to modulate the cognitive process of semantic memory-based analysis, in which meaning is mapped onto knowledge stores, by recording changes in the N400 ERP waveform, an electrophysiological index of semantic memory. An additional cognitive process is recruited that evaluates a word meaning with respect to its preceding context, and this process is indexed in the late positivity of ERP.

There is evidence that this evaluation process structures emotional knowledge, including valence, arousal, and dominance. For example, evidence suggests that late positivity is sensitive to affective valence. Holt et al. (2008) argue that this line of research supports social psychology findings of negativity bias or an increase in output from negative motivation systems. But there is no definitive idea yet about what cognitive processes are reflected by emotional late positivity. The most common interpretation is that it reflects both allocation of attentional resources to emotional

stimuli and a re-evaluation of emotional stimuli with respect to the surrounding context. Thus, variations in late positivity may be important in signaling changes in strategy during pursuit of rewards and avoidance of harm. Choosing negative over positive value may have survival value that comes from attending to threatening stimuli over pleasurable ones. Although this proposal likely explains many instances of changes in late positivity, that these changes also need to be considered with regard to contexts in which no external threat, or even externally pleasurable stimuli, demand attention; such contexts apply to meditation.

One might easily see that there are distinct moments during the meditation process. First there is the decision to sit for meditation, and then there is the action of sitting, followed by the practitioner actually performing the *ishvara pranidhana* tasks of bringing attention to the mantra and visualization of its various meanings expressed through the three *suddhis*. Out of these phases, changes in mental states occur. Performing the tasks results in entrance into quieter and subtler mental states where discursive qualities diminish, followed by the potential to eventually enter a state of absorption of conscious awareness. I think that the perception during these states of absorption is Arnold's intuitive appraisal, but, in addition, these meditation processes are all followed by the practitioner then coming out of the meditation. It is while coming out of the meditation that the ecstatic feeling of bliss takes over the person. The bliss feeling comes only at the moment when the meditator takes note of the passage of time, and thereby makes an inference that during that time he/she was not in a normal conscious state (but also not asleep or unconscious). One might think that this inference involves an intuitive appraisal that the object (*ishvara*) is good. In actuality, during the meditation the

meditator has recognized that what had been the object of meditation (*ishvara*) is actually the subject and that oneself is actually the object of *ishvara*. This is the tantric reversal, and this recognition results in the yogin's reflective appraisal of the phenomenon as "*samadhi*." Therefore, I think that both types of appraisal (the direct, immediate, and intuitive type and the conscious and reflective type) as defined by Arnold occur throughout these moments in the meditation process. The direct, immediate, and intuitive appraisals that occur during absorption were described in chapter four. These appraisals come with the feeling and awareness of increasing absorption into the object of meditation. In the ultimate state of absorption, one loses the sense of individuality, the "I" feeling and, therefore, the appraisal that comes after this stage of the meditation process seems to be the one of greatest confusion. The appraisal that oneself has just been in a "transcendent" state of consciousness comes about due to the occurrence of ecstatic emotion that we associate with absorption during this state. I think that this type of appraisal is a reflective appraisal (Arnold's second type of appraisal and the one that Proudfoot has in mind).

In both Arnold's and Lazarus's views, this evaluative component of intuitive reflective direct appraisal ties the object to oneself in some meaningful way (Reisenzein, 2006). In other words, reference to the object (such as *ishvara* during meditation) includes the evaluation of the personal meaning to one's well-being of that very object (see Lazarus, 1984). Understanding of this meaning-based aspect of emotion and appraisal is aided by Arnold's insight that emotions are characterized by intentionality, and the idea that the meaning of an object motivates a person to approach or avoid that object. This is where the personal meaning comes in. This notion of intentionality might

be combined with Proudfoot's idea of identifying the belief with reference to concepts from a particular tradition as a reason to reconsider his argument for the role of appraisal in explaining the mystical experience. To proceed, let us examine Alper's (1989) analysis of mantra on the point of the importance of establishing whether the practitioner has a personal or impersonal view of god for how one evaluates the object - that is, for the yogin's "truth."

There are those who take the emic tantric yoga view of the body and perturbance of *citta* within the *chakra* system as a generator of emotion programs as an actual model of the body. But as declared above, the purpose of the project at hand is not to analyze or assess this claim; such a task would need an interdisciplinary approach of content beyond the scope here. Others, though, might propose seeing the tantric emic view of the body as a metaphor rather than as some theoretical model of reality. Alper (1989), for example, considers seeing mantra as the phonemes of the *chakras* as a metaphor, and arrives at conclusions relevant to the discussion here.

On the one hand, Alper (1989) points out that seeing tantric mechanisms as a symbolic metaphor can be used as a tool to assess the human situation indirectly. The mantra itself (the sound) enables one to see the self-disclosive power of the act of mantric utterance. Moreover, Alper points out that metaphor is emotionally appealing for its explanatory power over intellectual explanations that characterize naturalistic explanations. When viewed in this way, we could conclude a comparison between neuroscience and tantric yoga models of the body with the statement that neuroscience models of the body are more accurate models because they are grounded in empirically tested concepts. Pushed a bit further on this idea of whether mantra should be viewed

strictly metaphorically, one might suppose that there could be an organization in the nervous system reflective of some structured order of the universe of which the *chakra* system is a metaphorical description – an order not yet seen and therefore not yet characterized by neuroscience.

However, Alper (1989) asserts that metaphorical assertions make claims that need to be evaluated epistemologically; simply translating (the meaning of) mantras not only limits their explanatory power but also ignores these underlying assertions. Seeing mantra in strictly metaphorical terms leads one to lose potential interpretative power. Therefore, as a way of bringing to light the potential to assess the truth of the existential assertions implicit in the mantra, Alper argues that there is a need to propose a non-metaphoric translation of mantra. Taking one particular mantra AHAM as his example, Alper proposes that this mantra "be read as a single word." Thus he suggests the following translation:

> "I" is the subject of the sentence; its predicate has to be supplied. There would seem to be two possibilities. If one concludes that the implied referent is personal, then the great mantra may be translated as "I [am Siva]!" If one concludes that the implied referent is impersonal, then it may be translated as "I [am That]!" In the first case, we would have to classify the sentence as mythological. In the second instance, we can admit that it is meant literally. If the two sentences are taken, as must surely be the case, to have the same referent, then the word *That* in the second sentence must refer to that to which the word *Siva* refers metaphorically. What can that be but the cosmos understood comprehensively as the redeeming object of religious fascination. The mantra AHAM taken to mean "I am Siva!" is thus revealed to be a metaphorical utterance whose indirect reference is precisely conveyed through the literal statement "I am That!" (pp. 280-281).

In this way, Alper concludes that he has shown a path for articulating in language what is often considered to be "ineffable." What does this mean for appraisal? We could apply this same translation to mantras used in *ishvara pranidhana* such that the referent of the

ishvara pranidhana mantras also could either be the personal *Siva* or the impersonal *That*. Both of these translations function equally for achieving the goal of absorption. Accepting Alper's translation of the mantra and applying this same translation to *ishvara pranidhana* allows us to have a literal worldly referent of *ishvara*, in addition to the typically understood metaphorical translation of Siva (god), and a referent that could potentially be indicated in natural as opposed to supernatural interpretations of mystical phenomena.

Regarding Proudfoot's "protective strategy," I found that modern neuroscience research on appraisal might help shed light on descriptive reduction. One theoretical problem left is that Proudfoot seems to think that the mind can never break from conceptualization (i.e., break from its fixation on thought (de Wit, 1991)), during certain religious practices such as tantric meditation techniques aimed at focusing the mind on an idea and moving the mind in that direction. Yoga identifies conceptualization as a *cittavrtti* or mental process, and as such asserts that this mental process is transformed through yogic practice, as are all mental processes. What does a non-conceptual state look like? Dunne (2006) suggests that when a concept is taken as a mental event, it can be considered a particular and thus an object of non-conceptual cognition. With this approach, what is important for understanding or explaining yogic perception is the positive or adaptive effects induced by the meditative experience, not whether the object is real. Therefore, we must work to better clarify the state entered into during meditation, and study the effects of this. Ultimately, Barnard calls for spiritual judgment in which one evaluates the value of the experience of such a state, and Proudfoot calls for a multidisciplinary approach to appreciate traditional religious approaches. These positions

indicate that an interdisciplinary approach that includes both naturalistic explanations and also traditional accounts can potentially satisfy a wide range of concerns that have been brought to bear on the problem of explaining absorption.

4. Meaningful Outcomes of Yogic and Neuroscientific Processes of Meditation

The analysis now turns to looking more closely at the question of meditation's utility or purpose or practical purpose as envisioned by both systems. One reason this issue is important is that a system's ends shapes the means and methods that one uses to obtain those goals. The aim in this analysis is to flesh out the differences between the differing approaches with regard to how their perspective interprets the purpose of meditation.

Tantric Yoga: A Spiritual Purpose of Meditation

As we have seen, tantric yoga is about "becoming" (Pensa, 1969). Muller-Ortega (1992) and others (e.g., Rastogi, 1992; Chapple, 1982) also emphasize the central importance of attaining a mystical state of becoming. Rastogi explains that by way of establishing "becoming" as the outcome of practice, tantra augments Classical Yoga's cessation or suppression goal of the state of *nirodha* with the process of sublimation or upliftment that accounts for continuity of awareness. Emotion plays a special role in spiritual attainment because through meditation normal emotional states such as attachment, aversion, anger, and fear are quieted. During purification processes of *ishvara pranidhana*, the mind's habit patterns are thought to dissolve. In this process, the

meditator consciously alters the learned habits associated with identification as a separate self.

However, for tantric meditation, the emotional well-being experienced through absorption is a side benefit - the real benefit is spiritual knowledge. This sublimation of emotional processes associated with habituated mental patterns results in changes in an individual's self-identification. The consequence is a transformation of the ordinary sense of self or the "I" feeling. In this state of becoming through direct contact with god there is a shift in identity such that the ordinary "I" feeling transforms into a transcendent "I" feeling. The meaningful outcome of concentrated sustained attention is direct experience with god, and this is seen in terms of spiritual knowledge: realization of one's spiritual identity is perceived as knowledge of god. Wheelock (1989, p. 116) explains, "The reason for performing the tantric *puja* does not lie in some external goal but is the experience of oneness with the deity to be obtained within the ritual itself. It is a form of *sadhana* [spiritual practice or meditation] whose final result should be the consciousness of god doing homage to god." Muller-Ortega (1992) explains that the tantric theologian Abhinavagupta pronounces this state as one of "illuminated" intellectuality, explaining that this state of mystical enlightenment operates in the functioning mind and senses.

In *ishvara pranidhana*, as is common in tantric practice, this resultant state is directly related to the mantra. Alper (1989, p. 52) links the epistemological or knowledge character to mantra utterance, asserting that it is a cognitive insight resulting from mantric utterance. According to Ksemaraja, as cited in Alper, "Cognition of that to which the mantra refers attains fusion with that reality." Mantra "works" only when it engenders the proper sort of cosmic consciousness – in yoga conceptualization is not a

form of knowledge, so "yogic knowledge" is direct perception. Thus mantra indicates that with which the practioner identifies. Mantra enables contact between the individual and the divine (Alper). This identification with cosmic consciousness occurs because in tantric theory, mantra is grounded in Siva (Alper); Siva is the ontological referent of mantra. The transformation to a higher state of consciousness leads to a cognitive insight of a spiritual "I." In this state the meditator's "I" feeling vibrates with the cosmic pulsation of the cosmic flux that is Siva (see Muller-Ortega (1988, 1992) on emission). This idea of "becoming" ties into the cognitive insight and knowledge resulting from absorption. The goal in cultivating *nirodha* (or absorption) via *ishvara pranidhana* is to attain knowledge of one's deepest self underneath the layers of normal identification.

In tantric yoga achieving the goal of *samadhi* has also been characterized in terms of recognizing the sameness between two things. Rastogi (1992) also writes about tantric yoga as the realization of identity between two objects (see also Chapple, 1982). Yoga Sutra 2.28 declares that "Once impurity has been destroyed through … [meditation] there arises an intuitive illumination that leads to discriminative knowledge" (Pensa, 1969, p. 207). Thus becoming, which might also be understood as evolving, involves developing the faculty of discrimination (Chapple, 1994). Chapple explains that the state of absorption in *samadhi* eventually leads to discrimination between *sattva* and *purusa* (YS 3.53), and that this is the recognition of the sameness between two objects. This recognition is spiritual knowledge: entering into this state of reflexive cognition allows one to overcome the perception of duality (Muller-Ortega, 2005). In addition to recognizing the temporary nature of duality (between subject and object), however, one must also recognize the gift of duality in that it allows for embodiment. Ultimately,

though, the goal of yoga is to sustain the realization of the non-duality throughout any state of human consciousness (Goldberg, 2005). This knowledge of god is the ultimate goal of *ishvara pranidhana*.

Neuroscience: Meditation as Adaptive Action: "Better Functioning" as the Adaptive Value of Meditation

For the most part, neuroscience outcomes of meditation are framed in terms of generating emotional well-being and overall better functioning. As we have seen, much of the literature on meditation concerns how meditation improves a person's functioning; for example, how meditation improves attention and self-regulation (more than relaxation alone), and improves memory functions and the ability to regulate emotions. In previous work, Posner and colleagues have shown that executive attention is an important mechanism for self-regulation of cognition and emotion (e.g., Posner, Rothbart, and Sheese, 2007; Rueda, Rothbart, McCandliss, Saccomanno, and Posner, 2005; Posner and Rothbart, 2000). Recently, they have extended these findings to suggest that integrative meditation improves attention and self-regulation, and improves these more than relaxation alone (as the control condition) (Tang et al., 2007). Another recent study also suggested that meditation improves functioning in the executive attention network, via increased control over the distribution of limited brain resources (Slager et al., 2007). Taken together, these studies paint a picture of meditation leading to better functioning via the manipulation of the neurophysiological processes of attention. In this way, the meditator is able to self-regulate the brain to improve functioning.

In the previous chapter, we also discussed the usefulness of altering memory for more adaptive behavior. In addition, neuroscience outcomes of meditation are framed in terms of generating emotional well-being (Shaperio, Carlson, Astin, and Freedman, 2006; Davidson, 2004), such as attaining a more habitually compassionate state. In this chapter, we discussed evidence suggesting that meditation changes emotional states, reduces negative emotions such as symptoms of anxiety and depression, and builds positive emotions such as happiness and peacefulness, possibly producing enduring changes in pleasure and reward circuits. In sum, neuroscience outcomes emphasize usefulness and adaptive significance of altering mental processes by way of meditation for better overall functioning.

Comparison: Meaningful Outcomes

One obvious difference between the outcomes of the tantric yoga and neuroscience approaches to explaining meditation is that the disciplines themselves focus on different goals. Whereas the tantric yoga explanations focus on spiritual purposes of practice, neuroscientists structure experimental designs and interpretative perspectives from the standpoint of well-being. Thus the two often frame the meditation processes differently, with neuroscience focusing on mental processes such as attention and emotion, while tantric yoga often describes meditation processes phenomenological terms such as absorption. These differences have important implications for explaining other aspects of human behavior. For example, as we have seen, the tantric yoga account of emotion processes accounts for agency, but literature suggests that neuroscience accounts do not.

Some attention has been paid to this disconnect of neuroscience research on meditation from the implicit/explicit spiritual purposes of meditation. Walsh and Shapiro (2006), for example, emphasize that why you sit (i.e., intention) is important, but neuroscience does not look at this intentionality factor. They also contrast the way that neuroscience looks at mental health but meditation traditions focus on spiritual goals. This difference of focus could be because neuroscience research often builds experimental approaches from previously theorized categories of mental phenomena. But because meditation is a relatively new behavioral practice within Western culture, and because there remain numerous unsettled debates throughout cognitive science as to how to theorize cognition and the mind, the categories employed in empirical studies may not reflect such specialized and uncommon states of mind. Because there is a question as to whether these categories are adequate when it comes to mystical or spiritual phenomena, there is reason to doubt, while certainly useful in accounting for some aspects of meditation, that the results and approach to conceptual issues in experimental design can yield a complete understanding of meditative phenomena.

However, although these two perspectives operate largely on different levels with respect to meaningful outcomes, they may be more similar than they seem on the surface. For example, both systems recognize the outcome of reward that comes along with meditation practice, and that this outcome can drive future practice. Also, the tantric yoga notion of becoming and the neuroscience view of adaptive advantage may be similar, since both relate to the evolution of consciousness. The self-reflective consciousness cultivated during meditation (with the intention of spiritual progress) also results in measurable changes in the physical body that have functional advantages. Finally, the

main motive according to both perspectives is that they are concerned with relieving suffering. These similarities regarding meaningful outcomes provide a point of consilience between the two views.

CONCLUSION

Chapter Nine

Towards a Theory of Meditation

We have described two broad approaches to understanding meditation. In the course of comparing the two, we found striking parallels and many common or similar terms and principles in their accounts of mind. Yet we have also seen important and serious differences between the two. We are also intuitively aware of dimensions of mental life that seem not to yet have been satisfactorily explained by facts about the body. Now we have to address directly the vexing question as to how these two accounts might be harmonized or combined in some coherent overall view of meditation, to the extent that it might be possible.

We might think of these two accounts in terms of mechanism and meaning. Each is powerful in itself (Alter, 2005) but they remain largely in separate worlds. One of them gives an objective, fairly impersonal analysis of the physical and chemical events involved in the phenomena of meditation. The other describes the flow and process of a personal, subjective, living experience. They are obviously "about" the same basic reality, but so different that it is a puzzle as to how they can be reconciled.

Here I can only begin to set up and explore this question. I hope to have set the stage for more in-depth discussions of this question in the future, by myself or others. Here is a preliminary sketch of some of the main issues to be explored.

The Naturalistic Approach

In an age of science and technology, one of the approaches to reconciliation (and thus to understanding meditation) most likely to be proposed is some kind of scientific naturalism or reductionism (Proudfoot, 1985). From this perspective, the physical events and laws or principles that seem to govern those physical events are the "real" dimension of meditative phenomena. The subjective, meaningful aspect of meditation are merely epiphenomenal, tacked on, and don't play any significant causal role in the activity or event of meditation.

Are there any good reasons to question this kind of reductionism, which has a lot of prestige because of the stunning successes and utility of natural science and its applications in our age? I will not attempt to convincingly disprove this kind of reductionism, but only try to articulate what may be some of the problems associated with it. Then assuming it might not be adequate, I will go on to briefly explore other possibilities.

A number of theoretical psychologists and cognitive scientists have discussed the appeal of reductionism, but also stressed its limitations (e.g., Taylor, 1985; Bruner, 1990; Slife and Williams, 1995; Osbeck, 2009). Taylor (1985) offers an especially effective analysis of this question. He examines the question of whether the kind of cognitive psychology prominent in recent decades that adopts a strong reductionistic approach to explaining human action and cognition is adequate to the task. He concludes that this approach cannot fully account for meaningful action. His analysis and arguments apply equally well, if correct, to the reduction of meditation phenomena to a material base. If he

is right, we will need to look elsewhere for a way to interrelate neuroscientific and yogic views of meditation.

Machine Models of the Mind

The "doctrinaire view" (Osbeck, 2009, p.17) of cognitive science, which encompasses a number of fields including the neurosciences, cognitive psychology, and philosophy of mind that are central to this dissertation, is a theory of mind that understands it in representational and computational terms. Machine models of mind are at the center of this view.

One of the strongest reasons to adopt a machine model of mind is that the appearances of reality are often misleading (Taylor, 1985, p. 192). The logic here is that because the way that we normally see reality is often misleading, we need to take a deeper look at nature or reality to see what is really going on. It has often been the case in history that some event or phenomenon appears one way and we explain it in particular terms, and then later through closer observation and applying modern scientific methods of observation and measurement discover that another explanation is better. That is, another explanation fits the observations more logically and is a simpler account of the world. One example is the discovery that the earth orbits around the sun, rather than the other way around as it once appeared to be the case.

This logic leads cognitivists to assume that phenomenological descriptions are misleading as to the underlying structure of things (Taylor, 1985). By this logic one would conclude that the yogic model that interprets meditation phenomenologically is misleading as to the true nature of meditation. Rather than looking to experiential

understandings of the world, machine models instead would depict the mind as a complex system of representations that processes at the individual level of representations (Osbeck, 1999). In this model, "Brain is the boundary of mind; or cognition is 'bounded by the brain,' meaning that cognition is contained within the brain and limited to its unique modes of processing" (Osbeck, 1999, p.18). In other words, in the machine model of the mind phenomena at one level are explained by a theory invoking factors at another level, where the second level offers us the more basic explanation. Because this second level is viewed as "truer" in an ontological sense, phenomenological descriptions can be eliminated from the most adequate explanation of that phenomenon. A second reason supporting machine models of mind is that the concepts and tools we use to explain the functioning of machines can be used to explain physical systems. By mapping physical stages of human computing processes on to formulae and law-like principles presented in computational language, we can assume that the causal relations between the physical states match the logical relations among the computational formulae (Fodor, 1975).

Building on this assumption, we can explain human actions in the same terms and principles as computers, such as the monitoring function discussed in chapter six on attention. Taylor (1985) explains that this logic suggests that because a machine does something, we can therefore make an analogy between the action of machines and the action of humans as a way of trying to explain human action. For example, a computer monitors some of its own operations, and this seems an analogue to some of the actions performed by humans, such as when humans monitor or observe their own actions. Notably, the monitoring function has been used widely in attention literature to describe an observational function of cognition (e.g., Gehring et al., 1993; Compton et al., 2008).

Specifically in the meditation literature it is used to describe a particular skill that is thought to be developed during meditation (Lutz, et al., 2008). Thus the observation that a machine does something like this, that it performs the same or a similar task, offers a third reason to accept the machine as a model of mind.

However, although the representational view of machine models has long been the guiding theoretical viewpoint of the cognitive sciences and its naturalist paradigm, there are reasons to doubt that this model can fully explain human life.

Self-interpreting Agents

Taylor (1985) argues that a primary reason not to adopt the machine paradigm is the fact that human beings are what he calls "self-interpreting agents." He explains:

> There is no adequate description of how it is with a human being in respect of his existence as a person which does not incorporate his self-understanding, that is, the descriptions which he or she is inclined to give of his emotions, aspirations, desires, aversions, admiration, etc. What we are at any moment is, one might say, partly constituted by our self-understanding (p. 198).

There is no way to answer the question of a person's state of feeling without self-description. This is because self-understanding shapes how we feel (Taylor). Proudfoot (1985) argues that this is the case for mystical experience, too, that attitudes and beliefs adopted prior to a mystical experience are formative of that experience. In fact, he argues, a person's interpretations of what occurs in these moments are constitutive of it. Thus, self-interpretations are constitutive of what we are.

In countering the naturalist's motives for adhering to a machine model, some thinkers argue that rather than being misleading, the supposedly phenomenal features of action and understanding are in fact a crucial part of explaining behavior. Descriptions of

phenomenal experiences are sometimes seen as a person's unique interpretation of actions and events. Proudfoot (1985) suggests that attempts to differentiate an experiential core from its interpretation may cause theorists to lose the very experiences they try to analyze.

Proudfoot explains that the emotion is defined by our understanding of an object or situation. Even before we are fully aware of it, an emotion is characterized by the sense we have of the meaning of its object to us. The quality of an emotion is given by the description of the emotion; having a particular emotion is defined in terms of being inclined to give that particular kind of description. The analytical distinction between description and object cannot be made (Taylor, 1985). In this way, our feelings are constituted by self-understandings. In this view, there is no core feeling which might exist independently of the sense of its object which constitutes it. The terms in which subjects understand what is happening to themselves are constitutive of the experience (Proudfoot, 1985, p.121).

Taylor (1985, p. 201) argues that we can have a certain emotion before we are ready to apply what we can later recognize as the essential description. We can understand our emotions either better or less well and emotion can be more or less explicitly formulated. This translation from implicit to explicit is important because by bringing implicit emotions into an explicit characterization we clarify the emotion, and in this way it is often transformed. The implicit/explicit distinction has crucial explanatory relevance in the understanding we have of ourselves as agents. It is because these interpretations can be explicitly formulated that the implicit/explicit distinction plays an

important role for human beings. This process of drawing out and explicitly articulating a feeling changes our self-understanding.

In this view, because of our nature as self-interpreting beings, the quality of our self-understanding plays an important role in explaining human behavior, and the implicit/explicit distinction has a crucial explanatory relevance in the understanding we have of ourselves as agents, and subjects of feeling. Taylor explains that our being agents is a condition of our self-interpretations being constitutive of what we are. He discusses subjectivity and meaning in terms of an explicit sense of self-understanding that arises out of an interpretation of oneself as an agent and the interpretations of actions and events as they have meaning for the agent.

The self-interpreting and self-understanding dimension of human nature is unmatched by machines, or perhaps this dimension could be seen in machines by the weakest of analogies. For example, a computer may monitor some of its operations, and this may be viewed as an analogue to self-understanding. However, Taylor points out that in this case there is a clear distinction between description of what the machine does (e.g., monitoring) and object (the machine). The operations are independent of the monitoring, even if the act of monitoring may bring about other operations which interact with the original operations. In other words, in computing machines there is no analogue of the relevance of the implicit/explicit distinction, and what this means for how we interpret ourselves as agents. The connected features of self-interpretation and an implicit sense of things have no place in machine models. However, because they are central to explaining human phenomena, this should lead us to rethink relying on the machine model to explain the mind.

The "Significance Feature"

Taylor (1985) responds to the claim of some cognitive scientists that a machine "does" something when we have designed it to do a task (and their suggestion that we take this as a reason for accepting the machine model) by pointing out a crucial difference between the operations of humans and machines. This difference centers on the significance of an action. He points out that the underlying processes of computing are different between humans and machines in terms of action attribution, and the force that attribution carries for each. Humans are able to explicitly identify the significance actions have for their intrinsic purposes, while machines cannot, providing an additional reason to rethink reliance on the machine model.

In one sense, computers are like humans in that they both accomplish a task. However, in a strong sense of action attribution, people and machines differ in the way that they get a task done. Humans and machines also differ in what kinds of actions they can do – humans can do more. On the one hand, we tend to see a machine as made for a particular purpose, and then attribute an action term describing that function as that machine's purpose. But Taylor (1985, p. 191) points out that this kind of attribution is external to the machine's make-up and function. Attribution of action-terms to machine operations is therefore relative to our own interests and projects. This is a weak sense of action attribution because it is relative to the observer. Moreover, if one asks, "What is it really doing?" there is no answer to the question for a machine. But the same is not true of humans. For a person, the answer to the question 'What am I doing?' is not irrelevant. In contrast to machine operations, human actions have intrinsic meaning and significance to a person that are not relative to the interests and purposes of the observer; action is a

directed activity with a certain privileged outcome. Our actions have significance that designate non-observer relative answers the question of what one is really doing. Moreover, Taylor continues, if we broaden our consideration of what types of actions get done, we can see that man can accomplish a much wider variety of actions than machines. For example, machines cannot meditate.

This significance, what Taylor (1985) terms the significance feature, emphasizes the difference between a human and a machine by describing action not from an observer's standpoint of what is getting done, but identifying a description intrinsic to the action itself. These action-descriptions focus on the significance of actions to agents themselves, on the meaning things have for the agent or self in a non-relative way. Taylor explains that this meaning perspective underlies our attributions of action to ourselves in a strong sense, and also underlies attributions of feelings and desires to states of being. Taylor further explains that references to the significance actions have to the agent are essentially involved in our definition of emotions. One might infer that this type of reference to the significance meditative consciousness has to the meditator is involved in the meditator's attribution of the "emotion" or quality of absorption to certain meditative states. These (emotion) concepts cannot rationally apply to non-agents, even, Taylor argues, in a metaphorical manner.

Taylor (1985) elaborates that the significance feature is crucially bound up in our characterization of ourselves as agents. This characterization underlies a strong sense and attributions of feelings and desires; reference to agency is essentially involved in the definition of emotions. Emotion concepts cannot logically and rationally apply to non-agents, even in a metaphorical manner. They make sense only in relation to us, and the

objects and events meaningful to us. For example, during *ishvara pranidhana*, the object of meditation is *ishvara*. This object is meaningful and significant to the meditator. Thus, the absorption associated with meditative consciousness makes sense as a phenomenon only because of it significance to the meditator, especially when the meditator describes the meditative state(s).

Because we are agents with a linguistic capacity, we have the capacity to formulate the significance things have for us. In this sense, formulating the significance of actions is to make it explicit, but formulation is to alter the significance. Therefore, the significance feature underlies other features including the distinction between implicit and explicit formulations, and self-interpretation. This sort of interpretation transforms the meaning or significance of something.

Taylor (1985) argues that just because features of self-understanding have no place in a computing machine we should not be dissuaded from explaining human action, because these are actually an essential part of what we must explain. Perhaps we could explain human behavior in the same principles as computers, but since computers do not do the same things as us, or only within the analogy of weak and strong action attributions, it is not clear that the principles apply. Thus how can we be sure that the weak sense explains the strong sense of explicit actions? Applied to meditation, "sidestepping" results in reductively explaining the feeling of oneness experienced during meditation, and the perception that this feeling comes from expansion and absorption of one's awareness into ultimate reality, in terms of biophysical and neurochemical activity within the physical boundaries of the skin, especially in the central nervous system. Those who accept the machine paradigm must believe that we can ignore the significance

feature, that which leads practitioners to describe absorption in terms of a feeling of oneness, because appearances are misleading and because phenomenology can be misleading as to the underlying structure. In other words, cognitivists assume that the significance feature is misleading and must be eliminated or set aside from events to be explained.

Taylor (1985) argues that if after broadening our consideration to these actions we are still confused (that is, if we still think the machine analogies apply), it is because we are in the grip of an old metaphysical view, one embedded in our epistemological tradition. This tradition makes awareness an inner medium of representation, which monitors what goes on in our bodies and the world. In this view, consciousness is understood as representation and as such is entirely separable from the processes which it monitors. Thus if consciousness plays any role in explaining these processes, it must be in interacting with them. But since interaction is ruled out in materialist assumptions, consciousness cannot be allowed any explanatory role. It is eliminated from the explanandum. In this model, consciousness can only serve as a way to access the processes which are the stuff of cognitive science. We have seen that tantric yoga has a very different view of consciousness from this old representational view and will not repeat these differences here. What is important is that there does not seem to be much agreement in contemporary thinking about consciousness from etic perspectives rooted in modern science. Moreover, focusing on consciousness as a way of interrelating subjective and objective realities may be a wrong track because the real difference between men and machines is not consciousness, but the significance feature (Taylor).

Consciousness is dependent on our capacity to focus on things significant to us, and this is especially evident in the case of emotions.

Taylor's (1985) argument that there is all the difference in the world between creatures with and without the significance feature argues against attempts to eliminate phenomenological description and subjectivity. Once we broaden the range of actions under consideration, the supposedly secondary character of the significance feature ceases. Significance is not a detachable feature that action has in some internal medium of internal representation. Once we look to emotions and feelings as an essential part of human nature, and see actions defined in terms of them, we undermine machine analogies. As we saw in chapter six on attention as a mental process of meditation, the machine analogy of monitoring cannot explain meditative absorption.

Conditions versus Causes

Throughout this dissertation we have considered a great amount of evidence that suggests that there are correlations between mental states of meditation and the physicality of the body. A major issue concerns how we should interpret this correlation. The theories we use to interpret this correlation vary as to the causal forces underlying the occurrence of meditative absorption. Which theoretical perspective, then, ought to guide our efforts to conceptualize the processes of meditation?

Because physicality is an obvious feature of human nature, we must find some way of considering it in relation to mental life. In cognitive science, the causal nature of biological processes, especially neurobiological processes, in mental states is widely assumed (Slife and Williams, 1995). Many yogis themselves in modern times have come

close to reducing the whole of yoga, including meditation, to its physical substrates (Alter, 2004). However, more generally in the field of psychology, Williams (2001) and others argue that reductive strategies fail because of flaws in the way they view the interrelation of "inner" and "outer" realities. In their view, developing a theoretical perspective that adequately interrelates meaningful human experience and the physical dimension of human being may require rethinking reductionism as the favored perspective on mind.

A promising alternative is proposed by Williams (2001), who argues that instead of seeing biological processes as brutely causally influencing mental realities, we view them as conditions that are necessary for mental happenings but do not generate meaningful experience in a deterministic manner. This proposal, I suggest, might serve as a cornerstone of our attempt to interrelate these two fundamental dimensions of human life.

Physicality as a Causal Force

The idea of physicality as a causal force is appealing as a theoretical stance on the mind for two main reasons. First, it aligns with the longstanding Western tradition of seeking a single explanatory principle. Second, it solves problems related to dualism, namely the many puzzles that arise when we try to conceptualize how two very different substances like matter and mind could possibly interact (Churchland, 1988; Olson, 2004). However, this position remains problematic for a number of reasons (Varela, Thompson, Rosch, 1991; Williams, 2001).

Williams (2001) explains that mind-body dualisms imply two things that make themselves untenable in mainstream psychology today. First, if minds constitute an ontological category apart from bodies, then the methods so far available to natural science and used in psychology from the nineteenth and early twentieth centuries to study persons may not be effective in studying the subject matter of psychology – that is, of phenomena that involve mind. The nature of the method itself may determine what phenomena are chosen for investigation—on other words, we may fit our subject to our pre-selected methods rather than adapt our methods to fit the subject matter. In addition, any theory in which mind stands as its own reality implies the "ghost in the machine" problem. This problem is that unless mind in conceptualized in completely naturalistic terms, there remains the theoretical possibility for souls, spirits, and other seemingly supernatural entities. Yet the field of psychology has sought to be wholly naturalistic and monistic and eliminate these theoretical potentialities.

One way of resolving the problems of dualism and the problem of relating mind and body is to ascribe to a philosophy of materialism and reduce the reality of the mind to the activities of the brain (Churchland, 1988). This takes shape in modern psychology in the form of the well-recognized trend to account for human behavior including intentions, preferences, emotions, cognitions, and psychopathologies in biological terms (Williams, 2001). Construing psychology in terms of biological processes is attractive in that the study of mental processes moves away from previous supposed impediments to the science of psychology (such as mentalism and spiritualism). In other words, reductionism meets modernity's interest in explaining the mind in terms of the natural world rather than a supernatural realm. Williams explains that one reason reductionism is so endemic

within psychological theorizing is that it is consistent with our longstanding interest in showing that there is only a single causal substrate underlying human behavior. Thus psychology holds onto materialism with the faith that this is the explanatory ground that can satisfactorily resolve or explain all events within its realm.

However, this strategy is distinctly anti-intellectual because it rather arbitrarily limits the range of theories and ideas at work in the field (Varela, Thompson, Rosch, 1991). With the strategies of reductionism, psychologists tend to develop and believe "only those theories and models that can easily be brought into conformity with known or presumed biological realities or adapting theories and models … until they do [conform with materialism]" (Williams, 2001, p.53). However, biology as an explanandum may not be satisfactory if one feels that it neglects the moral, social, relational, and other meaningful contexts within which mental states occur. Williams (p.53) explains, "Once one decides that naturalistic and materialistic monism is the ontological foundation grounding all understandings of human behavior, one must still deal with the reality of the experience of mental life."

Reality and the Problem of "Truth"

Slife and Williams (1995, p. 128) explain that the essence of reductionism in psychology is the claim that "X is really just Y"." This claim amounts to a truth claim about reality. In other words, naturalists believe that when X, a psychological or mental phenomenon, such as absorption, is understood fully, it will not be what it has seemed to be to some people, that is, mystical or ineffable, but what it more basically and truly is, namely, Y, a biological phenomenon (Alter, 2004). In essence, this claim assumes that

the biological understanding is "truer" in an ontological sense. Accepting this theoretical position means that one no longer needs the category X in explanations of the world.

For reductions of this sort to work, it is important to show that X really is just Y, otherwise one might be misled by the appearance of X (Taylor, 1985; Williams, 2001). "A reductive explanation, Y, must be simpler than X, but also adequate to the explanatory task for which X currently exists. [Moreover,] it must adequately account for everything that X accounts for, and it should do so without destroying or dismissing phenomena that used to fit in category X" (Williams, 2001, p. 54). Williams explains that one reason these requirements amount to an insurmountable conceptual challenge is the absence of a set of criteria by which reduction is judged to be adequate. In other words, it is impossible to judge whether Y has distorted phenomena of X too much, or whether something essentially important about the "X-like" phenomena is left unaccounted for. This is a judgment about whether only unnecessary complexity has been removed, or whether something more essential about the phenomenon has been eliminated. Yet, such judgments can only be grounded in a particular ontological perspective. What may seem unnecessarily complex and abstract in one metaphysical system may be quite simple, concrete, and essential in another. Thus, Williams (p.54) argues that, "if biological reduction is to be more than just prejudice, some set of criteria must be evoked to justify the reduction on grounds other that those entailed in a prior ontological commitment to biological materialism." As of yet, however, no criteria have been established that allow us to reasonably judge the simplicity or the truth value of a reduction, and Williams suggests that it is hard to imagine how such criteria could be established.

Theoretical Positions of Reductive Approaches

Contemporary literature from the philosophy of mind is replete with various positions that have been taken to describe potential relationships between the body and mind (e.g., see Churchland (1988) for an overview). Williams (2001) analyzes three main positions - derivation, eliminitivism, and especially supervenience (or functionalism) - at work in the reductive trend of psychology today. The first type of reduction, called derivation, occurs through language and consensus about language use. In this approach, either the theoretical constructs or the phenomena they are intended to explain are altered to the point that the reducing theory is seen to offer a better explanation. Williams gives the example of reducing the construct of agency to the ability to avoid noxious forces in one's life. For example, this is very close to the strategy used by Vivekananda and other yogis who psychologicalized yoga by theorizing it in modern terms (De Michelis, 2004). This strategy also ends in the criterion problem discussed above, since we still do not have a clear basis on which to judge whether a nonagentic account is adequate or whether it simply defines out of existence the constructs it seeks to explain

A stronger type of reduction than derivation is reduction by elimination. In this approach, one seeks to entirely replace one theory and its ontology with another. Applied to psychology, elimination occurs when one completely removes the concept of mind from explanations of behavior, such that there is a total identity between mind and brain. In this view, the mind does not exist in any way that cannot be accounted for by the brain and the ontology of brains.

Williams (2001) argues that reduction by elimination strikes right at the heart of our understandings of persons because of what we take ourselves to be and be about, and

therefore it has substantial consequences for psychology. To conclude that our thoughts, emotions, behaviors, etc. are fundamentally biological strips them of most of their meaning. However, biological events cannot mean what agentic acts mean. Following a biological eliminative reduction, mental, emotional, and moral actions and events are epiphenomenal on biological events and at most serve an instrumental function, helping us to carry out what we are bound to carry out anyway. Moreover, if the reductive theory were true, the epistemology underlying the natural scientific method would be the only type to satisfy or persuade a well-trained brain. Yet at this time, there is no body of research that can convincingly establish the validity of eliminative reduction. This is a conclusion I cannot argue for fully at this time. But many in the social sciences seem to believe—they seem almost take it as a matter of faith—that such research explaining mental, emotional, and moral actions by way of general laws that predict their occurrence precisely under specified circumstances should be forthcoming. However, such well-developed empirical theory is widely acknowledged to be lacking (Bernstein, 1976; Root, 1993).

Lacking empirical evidence to validate eliminative reduction, yet still intent on adhering to a materialist philosophy, many psychologists embrace a position that advances reductionism through the supervenience thesis (Williams, 2001). Supervenience assumes that one realm of phenomena (e.g., the mental) depends entirely on another (e.g., the biological), even though explicit and evident relations between the two are lacking. This position stops short of eliminating the entire reality of mental phenomena. Supervenience is unconvincing and problematic because it assumes as true precisely what it accepts as unproven and perhaps as unknowable. Also, it reduces in the end to an

eliminative position: supervenience is a necessary condition for eliminative reduction. In addition, supervenience must rely on the same data, generally lacking, as an eliminative reduction does to establish its validity.

Positions built on some kind of supervenience hypothesis acknowledge meaningfulness in human life and the depersonalizing or undermining effects eliminative materialism has on meaningful human life. Humans have rational propensities and are capable of moral concern and action. How these propensities evolved from the material substratum is impossible to explain given the present state of the cognitive and neurosciences. But for nonreductive materialists, how these qualities arise is not important. What is important is to understand human propensities and how to help people develop interest in living a fully functioning life. Yet, Williams argues, the unconcern for the lack of evidence supporting naturalist assumptions upon which this position is based is intellectually problematic. While nonreductive materialists call for rigorous research evidence for all aspects of treatment, they have no problem with the lack of evidence for their most far reaching ontological commitment or assumptions about human nature. We lack both the methodological knowledge to both establish the validity of the materialist assumptions of this position and to conduct a crucial test that would falsify the position. Research becomes merely suggestive, with findings that look like they might someday satisfying the desire for verified knowledge, even though concrete claims that are capable of being falsified are currently lacking. Williams argues that this theoretically thorny position, even though widely held, seems largely unexamined in psychology today. It is attractive because it allows psychologists to avoid such constructs as souls and agentic minds, and preserves the scientific status of psychology as a discipline, while at

the same time relieving them of the burden of defending their naturalistic or materialistic faith as true. However, as a weak form of eliminative materialism, Williams believes that supervenience is ultimately destructive of human agency, meaning, and morality.

Logical Problems with Biological Reductionism

To argue against the biological reduction of psychology is not to dismiss the importance of brains and chemical processes in psychological life (Williams, 2001); rather it is to ensure that we understand the proper role of our bodies in connection to our experience. With this goal in mind, let us now briefly consider several logical problems encountered when psychologists use to reduce mental processes to biological processes.

First, post hoc inference, in which indirect and inferential logic is used to implicate physiology in psychological disorders, is tautological (Slife and Williams, 1995). Post hoc logic proceeds by using the brains of abnormal subjects to assign psychological functions to discrete brain structures. This logic affects the very conceptualization of a disorder and its relation to the brain. However, this logic is quite different from studies that classify brain structures based on behavioral observations. Similarly, Williams (2001) criticizes the logic behind implying that certain disorders have chemical causes based solely on evidence of the chemical effects of certain drugs on neurochemistry.

A related strategy of argumentation results in what Williams (2001) calls ontological drift. To illustrate this strategy, he focuses on the relationship of genes as a specific biological element to behavior. By attributing behavior to genes, psychologists are able to invoke the concept of predisposition or tendency. In other words, with this sort

of biologicalization of psychology, one is able to claim that rather than inheriting traits or dispositions we actually inherit genetic material composed of chemicals. However, this attribution ensnares us in the problem that by evoking the concept of genes to explain behavior, one allows the concept of tendency or propensity to drift from one ontological state to another, drifting from a mental state to a physiological state and back again.

Williams (2001) describes another explanatory possibility illustrating ontological drift, in which behavior arises from an interaction between biological and environmental events. Because events such as stress level and childhood experiences are not physical phenomena, to speak of such things as "interacting" with physical, biological conditions ignores the ontological gap because there is no ontological ground on which two such different things (physical and nonphysical) can meet. Thus in this sense, the term interaction drifts between ontological states.

A further type of argumentation used to explain psychological events in biological terms involves argumentation from deficit (Williams, 2001). In this case, one argues that because we know that a deficit in brain region X results in a deficit of behavior Y, we can conclude, therefore, that normal brain structure/function of region X is responsible for normal functioning. Where the body of research evidence of a relationship between the physical and behavior is the strongest, it rather clearly shows that neurological deficits result in behavioral constraints. However, this type of study cannot be taken as evidence for the viability of biological reduction, nor of causality at all, since to constrain a behavior is actually the logical opposite of causing it. Thus argumentation from deficit cannot support the concept of biologicalization. Williams concludes that perhaps the strongest statement such evidence will legitimately permit is that a functional nervous

system is a necessary condition for behavior and perhaps, even that a normal nervous system is advantageous to normal functioning. Yet, he acknowledges, this seems to be little more than a banal truism.

The last type argumentation utilized in the biologicalization of psychology involves a misunderstanding of heritability. Heritability is accurately understood as the proportion of variability in a trait that can be attributed to genetic rather than environmental sources. But heritability of a trait is irrelevant to the question of whether the trait can be changed or influenced by environmental or other interventions. Williams (2001) argues that for this and other reasons, the biologicalization of psychology is unlikely to be achieved by the weight of evidence that any particular behavior has a high heritability.

Causality and Agency

When contemplating the role of biology in mental processes, psychologists ought to consider how causality is handled in the field of medicine where a disease is usually not seen as the result of the simple effects of a single cause or the end result of a chain of causes (Williams, 2001). Rather, medical disorders are the body's reaction in the presence of a host of relevant conditions. The old model of disease based on cause-effect type thinking has been replaced with newer intricate models of systems of nature. So while the separation of causes from effects continues to operate in psychology, Williams explains that this view is not at the cutting edge of modern In this view, causes are better thought of as a description of how things happen with necessary conditions for them to happen, rather than as the name of some independent force that makes them happen.

Williams (2001) argues that our modern understanding has become blind to this important aspect of causality, which Aristotle clarified long ago. His notion of cause carries responsibility, with implied rationality and meaningfulness. Williams cites more recent trends in science that similarly emphasize the point that causes are not to be divorced from the things and events that we take to be effects. A cause is thus more a property of an event, part of the ontology of the events, than a separate entity with its own ontological status outside of the event. Causes, even in the physical world, are holistic and contextual. Rather than trying to reduce persons to material biological things, psychologists should be interested in maintaining the status of persons and in understanding how person take account of their external and internal material circumstance.

Williams (2001) describes three ways to use the term influence that avoid how it is used in psychology as a way of imputing determinism and reductionism, as a way of hedging one's metaphysical bet in the absence of hard evidence for such determinism. To account for the mind-body relationship in human phenomena, including psychopathology, one might account for influence as a strictly causal influence in which there may be a direct connection from physical states to mental states. Second, influence could be conditional such that bodily conditions may constrain human action. The results of this sense of influence are constraints and limitations, with no reason to assume that these constraints operate without the intelligent contribution and cooperation of persons. Conditional influences operate like input but are not reductive.

A third type of influence is consequential influence in which life factors are influential because of their anticipated consequences, consequences symbolic and

anticipatory requiring a sense of purpose in life. It may be more difficult to connect this type of influence directly to bodily conditions. The mere existence of physiological conditions that introduce conditional constraints in a person's life will also introduce consequential influences as intelligent persons seek to take account of the conditions (physical, social, and moral) of their lives and set a course of action deemed worthy by them.

The belief that all human nature reduces to mere matter, according to Williams (2002), erodes our sensitivity to the moral tenor of life. At the same time, we must acknowledge the importance of the biological reality in our existence. Therefore, a foundation of relating these two dimensions of human life is to see neurophysiology as necessary conditions, but not wholly sufficient for appreciating the meaningful nature of human experience. This view of physiological processes as conditions might serve as the cornerstone of any attempt to interrelate the bodily and meaningful aspects of human life.

Meditation and the Embodied Mind

One perspective that has emerged from the ongoing inquiry into the best way to conceptualize cognition and mind, especially in light of the "facts" that have come to light about the mind in recent decades from experimental research in cognitive science (Lakoff and Johnson, 1999), is the idea that cognitive processes are embodied and deeply rooted in the body's interactions with the world (Wilson, 2002; Osbeck, 2009). In this view, cognitive processes are not disembodied, rather they are embodied; this means that cognition is deeply rooted in and arises from the body's interactions with the world. Bodily experience is integral to, even preconditional to cognition (Varela, Thompson,

Rosch, 1991). This "embodied mind" or embodied cognition perspective is an alternative to the classical cognitive science perspective that takes the machine as its model of mind (Lakoff and Johnson, 1999; Osbeck, 2009), including connectionism and emergence positions that are more recent developments in cognitive science (Varela, Thompson, and Rosch, 1991; Osbeck, 2009).

There are several central theses within this general perspective. The first is that cognition is "embodied" in the sense that cognition is body based, especially through mechanisms of sensory processing and motor control (Lakoff and Johnson, 1999). A second it that cognition must be understood primarily in terms of goal directed actions which occur in real-time, analyzed as interactions between cognition and the environment (Wilson, 2002), as opposed to cognition as static internal states. This idea moves beyond connectionism's system focus by conceiving of an agent's body and environment as one coupled dynamical system rather than two systems (Osbeck, 2009). A third thesis of the embodied mind approach is that cognition is situated, occurring in the context of the real-world environment rather than in an abstract symbolic world. Finally, embodied mind positions often involve the extended mind thesis of distributed cognition: the environment is part of the cognitive system, though this is the most controversial claim of embodied mind perspective (Wilson, 2002).

Part of the embodied mind critique of representationalist theory (and its machine model of mind) is that the representational focus on "internal" processes of cognition underplays or overlooks environmental factors that are essential to explaining cognition (Osbeck, 2009). Thus, embodied mind positions favor relational analyses in which the embodied mind and environment are inextricably linked. As part of their critique of the

representational model of mind, Varela, Thompson, and Rosch (1991) also question the central premise about reality upon which representationalism is based: that there is a stable world "out there." They explain (p. 150), "if this critique [of representationalism and a stable world out there] is valid, then scientific progress in understanding cognition will not be forthcoming unless we start from a different basis from the idea of a pregiven world that exists 'out there.'" In this view, we must challenge, both theoretically and empirically, the idea that a pregiven world exists out there and is internally recovered in a representation.

Rather than seeing cognition as recovery of a pregiven outer world (realism) or projection of a pregiven inner world (idealism), they see cognition as embodied action. Varela (e.g., 1991) proposes "enaction" as a way of seeing our activities as reflections of a structure without losing sight of our own experience. The enactive approach highlights the long-held (since Piaget) idea in psychology that "cognition depends on the kinds of experience that come from having a body with various sensorimotor capacities" and emphasizes the idea that "these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological, and cultural context" (Varela, Thompson, and Rosch, 1991, p.173). This position resolves the tension between realism and idealism because we accept that the neither the world nor our experience is independent of the other. No longer can we take the exclusive approach of asking what must the world be like for science (which views entities) to be possible, as is the position of positivism (Soskice, 1985).

Thus, extending Merleu-Ponty's phenomenological program, Varela et al. (1991) argue for a "circularity" between science and experience, such that our phenomenological

reality informs and shapes scientific pursuits. We cannot assume the realist's claim that the world, its structure, and relations, exist independently of our theorizing. This position maintains that it is the combined ongoing circularity between our theorizing and experience that provides us with access to the structures. Clearer experiences beget better theories, and vice versa. This proposal includes the realm of scientific methodology: Varela proposes that meditation can be an instructive methodological tool to scientifically access the experiential dimension of cognition that has been so elusive of empirical approaches to mind.

A discourse of science that is grounded in experiential insights borne from daily meditative contemplation will surely refine the metonymic process that unfolds as the practitioners of both methods, sometimes (perhaps often) one and the same person, continually exchange ideas between the two perspectives in an ongoing effort to discover the "truth." At the same time, the discourse of practice is brought to light in a heightened climate of rigor for rational examination. Whereas the cultural milieu of meditation practitioners and spiritual seekers, as any religious context, often can become doctrinaire (Proudfoot, 1985), influence from the tenor of science pushes back to clarify meanings. With this circularity between science and experience we gain the most sophisticated access to the structures of cognition, whether phenomenological or physical.

If Varela is right, and the embodied mind perspective successfully closes the book on the ontology of realism, then this solves the problems with relativism that Alter (2004) brought to light regarding the shifting theoretical realms of yoga and the confusions that come with hybrid models of reality.

The embodied mind perspective also affords us an opportunity to revisit the use of metaphor in everyday language, philosophy, and the discourse of science. Previously we had operated with the contention that the tantric model of subtle physiology, and the mantra used to visualize the reality depicted by this model – the meaning of which suggested that the meditator's self-identity is the same as the cosmic reality - should be understood in terms of subjective experience. With the insights about how the mind works gained from cognitive science, and the embodied mind perspective, we can now talk about metaphor in terms of embodiment from within an etic perspective (Lakoff and Johnson, 1999). Lakoff and Johnson's cognitive treatment of metaphor expands on recent challenges to linguistic theories about metaphor (e.g., Soskice, 1985) by arguing that metaphor conceptualizes subjective experience. At its heart, this approach proposes that we see metaphors as experientially grounded mappings within the neural systems of the body.

Soskice (1985) raises the question of how any non-observational terms (like metaphorical theory) can be regarded as reality depicting, especially in cases when we are using models and metaphor to depict things we cannot possibly comprehend. Metaphorical theory terms seem to open to criticism of lacking specifiable referents. For Lakoff and Johnson (1999), reason and metaphorical thought grow out of sensorimotor – that its, nervous system - experience. Human concepts and reason are shaped as much by the body and the brain as by reality (Varela, Thompson, and Rosch, 1991).

In light of this view, I suggest that previous attempts to theorize the yogic body in terms of physicality failed because they sought a too literal, basic, and rudimentary translation of scientific conceptualizations of the body and approach to and mapping the

body of science and the body of yoga. The embodied mind approach takes a more sophisticated approach towards mapping subjective experience within the body. It is mapped through the sensorimotor and higher neural networks of cognition (Lakoff and Johnson, 1999) through an ongoing moment-to-moment engagement with environmental, social, cultural contexts – in essence a "lived world" (Slife and Williams, 1995). This is the embodiment of subjective experience. This perspective still allows us to retain the traditional interpretation of the yogic body as experiential; however, now we can see more clearly how this dimension is embodied.

Where Does this Dialogue Leave Us?

Examining *ishvara pranidhana* from this multidisciplinary perspective has helped us to clarify important distinctions between yoga and science and take a few steps towards resolving some of the problems that have developed in modernity with the modern theories of yogic meditation. This approach has also allowed us to consider broader questions that have faced contemporary scholars regarding cognition, the mind, and the body. Thus, this dialogue has also contributed to the ongoing conversations in cognitive science. I have extended the scholarship on modern yoga by examining a yogic method of meditation that does not fit so clearly within the predominant theories of modern yoga and showing links between modern yoga research, which is often in fields of anthropology and religious studies, and the cognitive sciences.

My examination has led to the insight that these two systems of tantric yoga and neuroscience, which originated in vastly different socio-historical contexts with different theories about and methodologies for discovering the way the mind works, have both

arrived at strikingly similar truths about the mind: synchronization, amplification, extinction, sequential activity, etc. This surprising convergence helps us recognize the importance of maintaining the integrity between the two systems, especially because we have seen so clearly the kinds of problems that develop with that there are major problems with translation between the two systems. Holding in balance the essential truths of the two systems maintains the power of both (Alter, 2004) to pursue and clearly articulate the truth from these dual expressions of physical and experiential. The two systems each pursue this purpose of discovering truths about human nature and the way we cognize the world in their explanations about meditative absorption. Surprisingly, the two different purposes of these two systems do not color what each comes up with; both systems see the mind as operating in largely the same way. Therefore, we can see tantric and neuroscientific approaches as complementary approaches.

This dissertation examined the phenomenology of meditative absorption and the way we think about "mystical" experience in ways advocated by Proudfoot (1985). It suggests that absorption, including the "mystical" kind of absorption described in yogic literature, need not be seen as "ineffable", or solely in emic terms. Rather, a dialogue between the two systems allows us to see cognition in terms of embodiment, and recognize that both physicality and experience are embodied within the person. By focusing on moments of balance between the seemingly distinct realities of subjectivity and objectivity, mind and body, self and consciousness, we can see absorption as a means of consciously enacting embodied transformation.

Conclusion

Indian yoga has traveled across many centuries and many lands, and traversed many intellectual systems to arrive in our life today. An authentic inevitable meeting of yoga with science today requires that we examine the challenges of meditative practice in the body and scientific study within the context of experience with an open mind. This dialogue between the two has forced us to talk about yoga without the threat of eliminating the yogic phenomenon of transcendence. The embodied mind perspective is a way of thinking about meditative phenomena in a non-dual, non reductive way. It allows us to credit the reality and meaningfulness in the sphere of yoga, if we are so inclined. At the same time, the embodied mind perspective curbs tendencies in the meditation tradition towards authoritarianism and dogmatism. This perspective requires an empirically grounded philosophy that avoids speculative excess. Considering meditation from this perspective gives us new models and methods with which we can analyze the reality of the mind.

When approached in this way, what results from the meeting of western and Indian ways of knowing human nature? We come to a common understanding of the embodied transformation of meditative absorption as an ongoing process in which consciousness expresses itself in multifaceted dimensions of human nature. At the very least, a balanced critical dialogue can help both science and yoga advance the shared goal of knowing reality in a way that allows both to reside in the complementary embodied dimensions of physicality and experience.

Appendix A

The Brain: A Brief Overview of Neuroscience and the Approach of Neurobiology and Neurophysiology

The field of neuroscience has different levels of analysis by which scientists infer knowledge about the material substance of the brain and its interactions with the world. For example, neurobiology is a subfield of neuroscience, with the aim of studying the nervous system at the molecular, cellular, and biophysical levels. Neuroscience also studies the nervous system at the systems and behavioral levels. Within the field of neurobiology, neuroscientists have identified specific neuroanatomical centers, cell types, and neurotransmitters and receptors of a range of psychological phenomena and behavior. As another example, the neuroscience subfield of neurophysiology defines the functional workings of the brain from its neurobiology to higher processes.

Cellular mechanisms underlying nervous system functioning and communication are well understood. One of the central cellular mechanisms is the synapse at the junction between two neurons that enables chemical flow of information between neurons. Figure 7 shows the basic features of this mechanical transfer of molecules. The synapse at the junction between two neurons enables chemical flow of information between neurons and lies at the heart of neurobiological communication in the body. This cellular activity is the crux of all neural activity measured through different neuroscientific methodologies. A main philosophical assumption of neuroscience is that this sort of activity at the neurobiological level causes all mental process, including such mental processes as

cognition and consciousness. Therefore, some basic understanding of synaptic mechanisms is essential for advancing a dialogue between neuroscientific and yogic explanations of the state of consciousness of meditation.

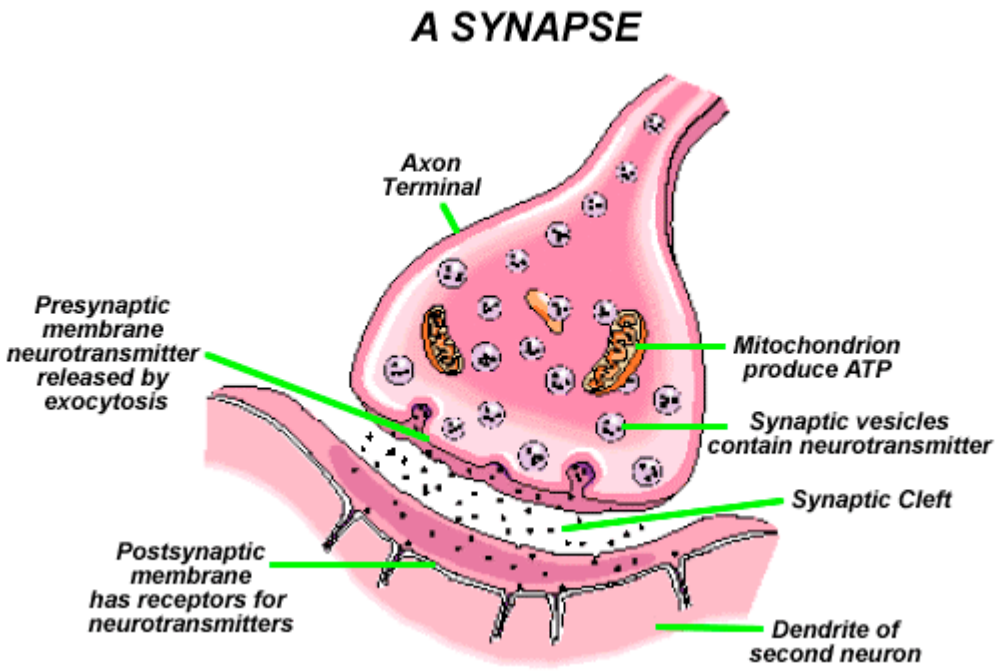

Figure 7 Neuron synapse or chemical signaling between two neurons. Neurotransmitters are shown emptying from the synaptic vesicles into the synaptic cleft signal the post-synaptic neuron on its dendritic spine. Ions that pass through the receptors, and ions that pass through the axon membrane, can be seen passing through the receptors represented as black dots.
Source: www.coolschool.ca/lor/BI12/unit12/U12L04.htm accessed 4/4/08

Chemical molecules called neurotransmitters and ions enter cells through protein channels embedded in the membranes of the cells. As shown in Figure 7, neurotransmitter molecules pass from the end of the axon terminal of one neuron's axon to the receptors in the cell membrane of the dendrite of the next neuron. Ions also pass through cell membranes to regulate cellular signaling, but are not shown in the figure. Cells have both ligand (molecule) gated and voltage gated ion channels. When the ligand,

or chemical molecule, binds to the cell's receptor, the channel opens it so that ions can then pass through the channel. In contrast to ligand gated channels, voltage gated channels operate by sensing the cell's voltage level. According to Kandel (2000, p. 105), "ion channels have three important properties: (1) they conduct ions, (2) they recognize and select specific ions, and (3) they open and close in response to specific electrical, mechanical, or chemical signals." Variability in voltage levels affects the opening and closing of the voltage-gated channels, thus regulating the passing of ions through those channels. The movement of these ions and molecules regulates the activities of nerve cells and communication throughout the nervous system. The number and frequency of ions and molecules moving across the synapse regulates the cells' action potentials and neurotransmitter release responsible for cell-to-cell communication. This synaptic communication regulates functions on cellular and systems levels throughout the nervous system.

Nomenclature in neuroscience literature used to reflect the brain areas of activity, including research literature on meditation, are based on well-defined subdivisions or lobules of the brain rather than subtler neurobiological activity. Physical differences in the structure of the brain are obvious just by looking at it. There are four main lobes of the brain, with the term "lobes" generally designating areas of the brain's outer covering, or cortex, with specific regions of the cortex known as cortical areas. Large general regions of the brain are as follows: frontal lobe as the area in the front part of the brain near the forehead; temporal lobes as areas on the left and right sides of the head near the ears; parietal lobe as the area of the brain near the top of the head; and occipital lobe as the brain area in the back of the head. Figure 8 indicates the nomenclature for the

directions of these different regions such as prefrontal cortex being in the very front of the brain and medial frontal cortex located more in the medial or center of the front brain. These lobes help to define specific orientations of the brain such as front (anterior) and back (posterior), right and left, and help pinpoint specific areas of the brain that are associated with specialized mental functions and behaviors.

The cortex of the central nervous system (CNS) as a whole is generally recognized as the area of the brain specialized for cognitive functioning (Kandell, 2000), although all of these cortical regions have specific functional mental capabilities. The frontal lobe, for example, is the area of the brain thought to be involved in the highest order of mental processing; the parietal lobes as the top areas of the brain that process sensory information and temporal and spatial perception that are involved in meditation (Lazar, 2000; Newberg, 2001); the temporal lobes are the regions of the brain on either side of the head and primarily have to do with perceptual experience, such as auditory (sound) and visual processing, especially object recognition, and memory functions; and the occipital lobe is the area in the back of the head primarily involved in vision (Kandel, 2000).

Neuroscience further defines more specialized regions within these major areas by obvious structural differences and more subtle anatomical differences such as differences in cell types. For example, the frontal cortex is further divided into more specialized areas, including the prefrontal cortex (PFC), including the orbital frontal cortex (OFC), the dorsolateral prefrontal cortex (DLPFC), and medial prefrontal cortex (MPFC) – areas which, as discussed later, are all activated during absorptive meditation and similarly are all involved in some mental processes associated with meditation. The name

"dorsolateral" prefrontal cortex, illustrates the usefulness of directionality nomenclature to indicate specific location within the brain. Specifying the directionality within the names of these areas is important for identifying the locations of the brain areas since these areas each play a different role in cognitive processing and it is important to distinguish between discrete areas. For example, as is discussed later with regard to meditation, these two areas of the prefrontal cortex (PFC) are differently activated during subtle changes in mental processing. These types of functional differences between cortical brain areas are generally distinguishable only through knowledge about differences between cell types within the cortex.

In addition to the cortex, there are numerous other areas where brain matter is structurally and functionally quite different from the cortex. Areas of the brain other than the cortex are anatomically distinguishable by sight because of the shape of physical features of the brain tissue as well as cellular morphology. These areas are distinguished further by their functional attributes. Figure 8 shows these non-cortical regions, including subcortical limbic areas (emotional and learning centers) of the brain (including hypothalamus, amygdala, hippocampus, septum, and thalamus); the midbrain; the brain stem; and cerebellum. The spinal cord (not shown) is also an obviously visually distinguishable brain area. Subcortical limbic areas of the brain and their main functions include the amygdala involved in emotional processing, the hippocampus involved in memory, and the hypothalamus involved in regulating basic body functions and regulating the endocrine system. More rostral brain regions include the pons, the brain stem and cerebellum. These brain areas regulate basic functions, such as breathing, heart rate, arousal, eating, sleeping, and mating. In the peripheral system, the brain interfaces

with the body through nerves extending from the spinal cord into the body; the spinal cord receives sensory information and controls motor function. The cranial nerves at the base of the brain receive sensory information and exert motor function to the neck and face region. These neurons connect the body and outside world with the brain regions inside the head and their associated higher mental functioning. The peripheral nervous system (PNS) also includes the sympathetic (arousal and expenditure of energy) and the parasympathetic (that controls functions that occur during a relaxed state) systems.

Neurobiological activity at the molecular, cellular, and biophysical levels forms the basis of both neural-activity and neurophysiological interactions between the brain and the body. The terms "neural activity" and "neural activation" are used in this dissertation to refer to both activity at neurobiological cellular and molecular levels, as well as changes in mental states. When used in this second sense of changes in mental states, these terms reflect *higher activation* - the activation of entire circuits, for example. In this view, a "neurocircuit" is defined as a functional circuit that is physically (anatomically) connected by neurons. When neurons that are anatomically connected activate – that is, when an axon of one neuron is so close to the dendrites of another neuron that they form a synapse or functional connection when activated, the activation forms a functional neurocircuit. Activation of the circuit – that is, activation of the neurons comprising the circuit – corresponds to some mental function. In neurobiological usage, however, "neural activity" refers to any activity *within* the neurons themselves, specifically neural firing, or the spiking behavior of action potentials. Thus, in neurobiological usages, the terms "neural activity" and "neural activation" indicate both intra and extra cellular processes, such as movements of ions through cell membranes and

the effects these processes have within the cells, such as DNA transcription, communication between neurons (neurotransmitter signaling through synaptic gaps), and overall patterns of neural-hormonal flow through blood vessels and capillaries. Since neurobiological activity forms the basis of both neural-activity in terms of mental processes, brain and body interactions, and activity at molecular and cellular biological levels, when the terms “neural activation” and “neural activity” are used in this dissertation they refer to systems of molecular level processing.

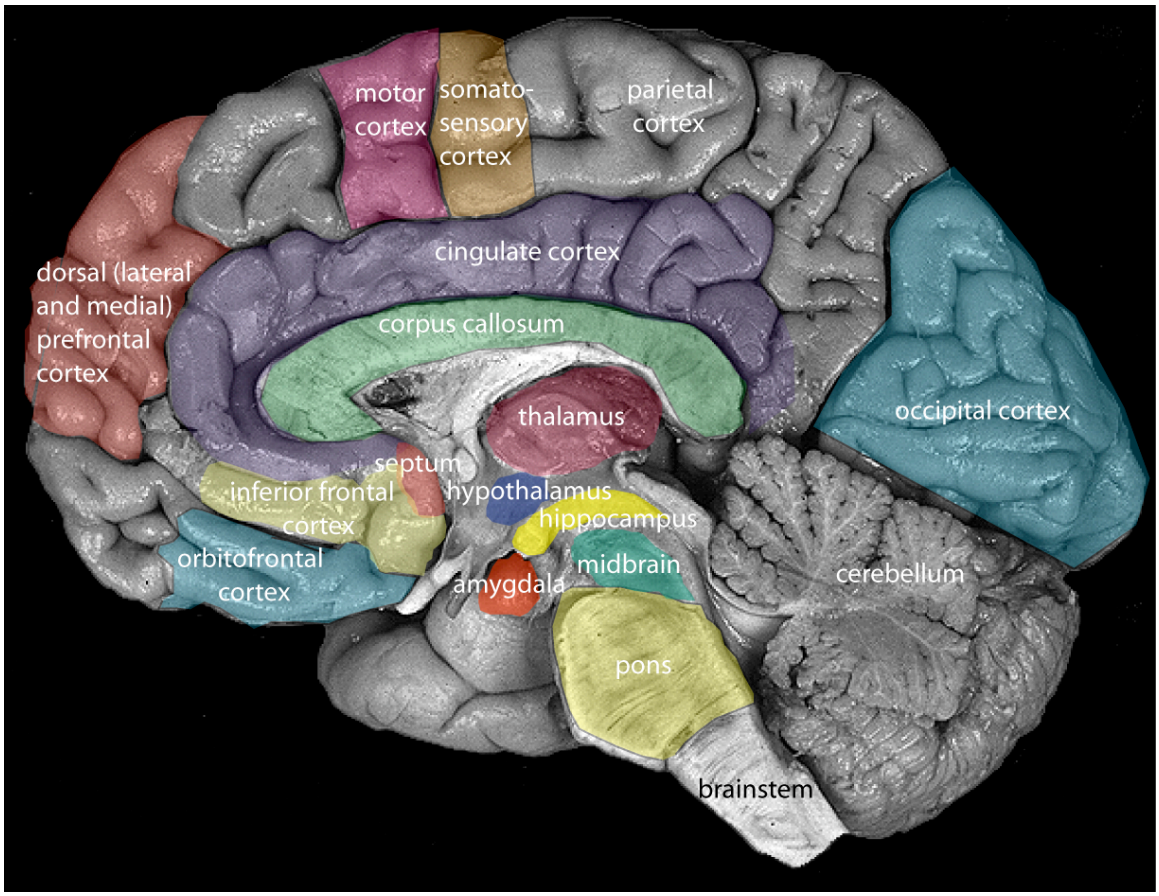

Figure 8: Major areas of the brain.
Three primary distinctions convey directionality of brain regions. Dorsal refers to the front part of the body while ventral refers to the back part. Lateral refers to the outer parts of the head while medial refers to the inner portions. Rostral (anterior) means towards the forehead part of the head while caudal (posterior) refers to the back region of the head. Source: Brain image adapted (photoshop to highlight brain areas) from The University of Washington Digital Anatomist Image Collection Manager website: http://imagemanager.biostr.washington.edu accessed 6/15/06.

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